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REPORT ON THE SUBMARINE ERUPTION OF MYOJIN-SHO

First survey. September 21–24, 1952.

Second survey. January 29—February 2, 1953.

Part 1. First Survey of Myojin-sho.
(With Text figures 1-6, Plates I-XXIV and Tables I-IX)

Part 2. Second Survey of Myojin-sho.
(With Text figures 1-4, Plates I-V and 1 Table)

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REPORT ON THE SUBMARINE ERUPTION OF MYOJIN-SHO

Tokyo University of Fisheries

(First survey, September 21-24, 1952. Second survey, January 29 to February 2, 1953)

Part 1. First Survey of Myojin-sho (with Text-Figures 1～6; Plates I～XXIV and Tables I～IX)

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1. Introduction

Owing to that the Japanese Islands lie within the circumpacific volcanic zone, numerous volcanoes are found on the land and in the adjacent seas exist many volcanic islands, and furthermore, on the sea bottom many banks built of volcanic rocks have been found. To make a scientific survey on submarine eruptions, is very important from the standpoint of geology, volcanology, stratigraphy, oceanography and fisheries, but only rarely can such an opportunity be met with. On September 17th, 1952, a submarine volcanic eruption was reported from the Pacific Ocean, southwards of the Japanese Islands. To undertake scientific observations of the eruption activity of this submarine volcanicity, the Tokyo University of Fisheries immediately formed a party by which the first survey was prosecuted.

The Fuji volcanic zone traverses the central part of the Japanese Islands from south to north and extends into the sea bottom of the Pacific Ocean via Izu

Peninsula of Shizuoka Prefecture. Therefrom it extends as far as the Marianna Islands. Above this volcanic zone are found the islands of Izu-Oshima, Miyake, Hachijo, Aogashima, Io-jima besides many other volcanic islands, and on the sea bottom submarine volcanoes exist as banks. Aogashima, which is situated about 300 km southwards of Tokyo, is an extinct volcano. About 50 km southwards of Aogashima and appearing above sea-level is the summit of a submarine volcano.

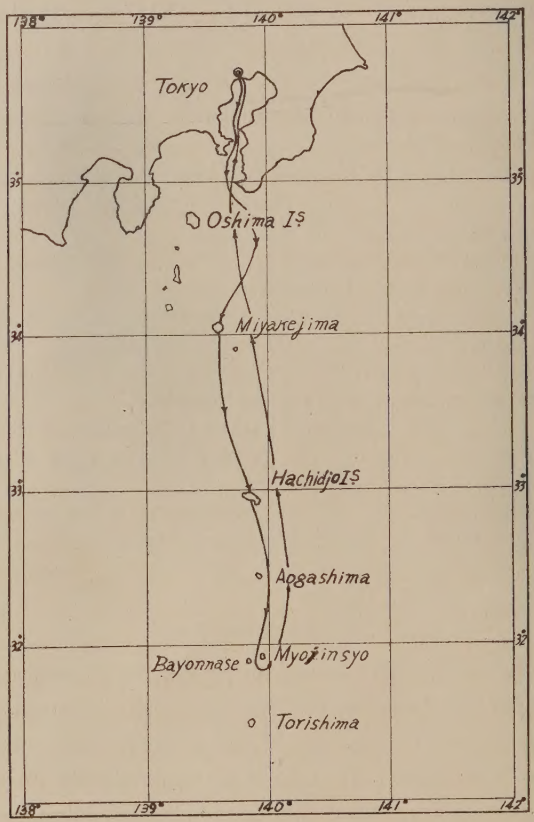


Fig. 1. Course of Shinyo maru.
(The first survey of Myojin-sho, September 21-24, 1952)

This summit is known as the Bayonnaise Islands and lies in Lat. 31°55.3′N., Long. 139°54.5′E, The new submarine eruption which was first reported by the Eleventh Myojin maru, a fishing vessel, on September 17, 1952, lies in Lat. 32°10′N., Long. 140°05′E., about 10 km eastwards of the aforementioned island. Immediately the Marine Safety Bureau dispatched the coastal patrol ship S. S. Shikine to make an investigation of the reported eruption. The position of the submarine

eruption was thereby reported as Lat. 31°56.7′N., Long. 140°00.5′E,, and the height of eruption above sea-level was 30 meters and the breadth in north to south direction was measured as being 100 meters, Thus the newly formed rock bank was reported bo be a result of the eruption. Based upon the foregoing reports, the Hydrographic Bureau named this rock bank "Myojin-sho".

At the time of the first expedition by the Tokyo University of Fisheries, Myojin-sho at low tide, was exposed only one meter above sea-level and separated by a distance of about 200 meters, two isolated rock masses projected above sea-level. The position of these was Lat. 31°56.8′N., Long. 139°59.5′E., or about 4.6 nautical miles from the Bayonnaise island in 71° direction. Tremendous explosions were repeatedly taking place. The present survey was undertaken with great risk during the volcanic activity for the following reasons:

(1) To maintain safety for sea routes, Numerous fishing crafts and vessels visit the fishing grounds for tropical and subtropical fish which lies in the vicinity of Myojin-sho, and, vessels leaving for the south sea islands generally follow the islands stretching between Japan and their destination.

(2) To determine the change, if any, in the fishing grounds. This vicinity is a good fishing ground for pelagic fishes and lies within the course of their migration, also the sea bottom yields abundant commercial corals. Owing to the submarine eruption it has become necessary to determine the change in bottom configuration and the physico-chemical change in sea-water from the viewpoint of fisheries.

(3) To accumulate oceanographic data. This survey affords a very good opportunity to study the hitherto unknown nature of the subcurrent of the "Kuroshio" current by means of the direction of bow of the ejected material. Also this opportunity is valuable for a study of changes in the physico-chemical composition of the sea water owing to the effect produced by emmited gases from the eruption and their effect on the marine life.

With the above mentioned purposes, the party of scientists boarded the training ship, S.S. Shinyomaru (229 tons) of the Tokyo Universiy of Fisheries and departed from Uraga Harbor at 5:00 am on September 21, 1952. Arriving at Myojin-sho on the 23rd, fruitful investigations were undertaken and the party returned safely at Uraga Harbor at 5:00 pm on the 24th of the same month.

The Fifth Kaiyo-Maru, a patrol ship of the Hydrographic Office which departed from Tokyo on September 21, 1952 to make investigations on Myojin-sho, was later reported as missing, Search for the Fifth Kaiyo Maru, by sea and air, revealed floating broken fragments of that ship, from which it was considered that the Fifth Kaiyo Maru sank due to the eruption of Myojin-sho on the 24th.

A total of 31 persons, which included a party of scientists and members of the ship met their unfortunate death by the activity of the submarine eruption which they endeavoured to investigate. The great sacrifice of the scientists and crew who so willingly undertook this dangerous cruise will live throughout history, Their sacrifice will leave a great gap in the men of science of Japan, but it is to them that a new page has been opened in the science of the sea. Here I pay my respects to this group of men who so willingly gave their lives to the progress of science.

Table I. Record of the past eruption near Myojin-sho.

Date of report	Position	State of eruption
1896	7.5 Nautical miles North from Bayooase rocks	Wave break on bank
April, 1896	.....	Eruption
February, 1915	6.0 N. miles East from Bayonnase rocks	Bank, 10 m depth
April, 1915	ditto	Submarine eruption
June to July, 1915	Between 10 N. miles East-20 N. miles West from Bayonnase	ditto
May, 1934	5 N. miles East from Bayonnase	Yellow color water with sulfer smell spread 180 N. miles
February, 1946	31°57′ N. 140°01′ E.	New volcanic Island. Length, 200 m; wideth 150 m
April, 1946	31°57′ N. 140°01′ E.	New volcanic Island, Two spines, each 100 m. high
October, 1946	ditto	New volcanic Island, one spine only
December, 1946	ditto	Wave break on bank

2. History of Volcanism, Bottom Material and Submarine Configuration in the Vicinity of Myojiin-sho

(1) Bottom configuration and bottom material in the vicinity of Myojin-sho.

a) Submarine configuration.

The Fuji volcanic zone via Izu Peninsula extends southwards into the Pacific Ocean where its portions, new elevated above sea-level, are the cores of the many Islands offing the peninsula. These volcanic mountains raise 2,000–3,000 meters from the submarine platforms. The eastern side of the stated platform is provided with steep slopes which pass into the southern part of the Japan Trench whose depth is 5,000–7,000 meters. From the Oceanographic Chart No. 81, it can be noticed that Bayonnaise Island (+9.9 m) lies to the east of Myojin-sho. In the vicinity of Myojin-sho there is P. A. (1946 A. C.) and on the eastern side is a 10 meter deep shoal. By drawing the bathymetric contour, it is found that

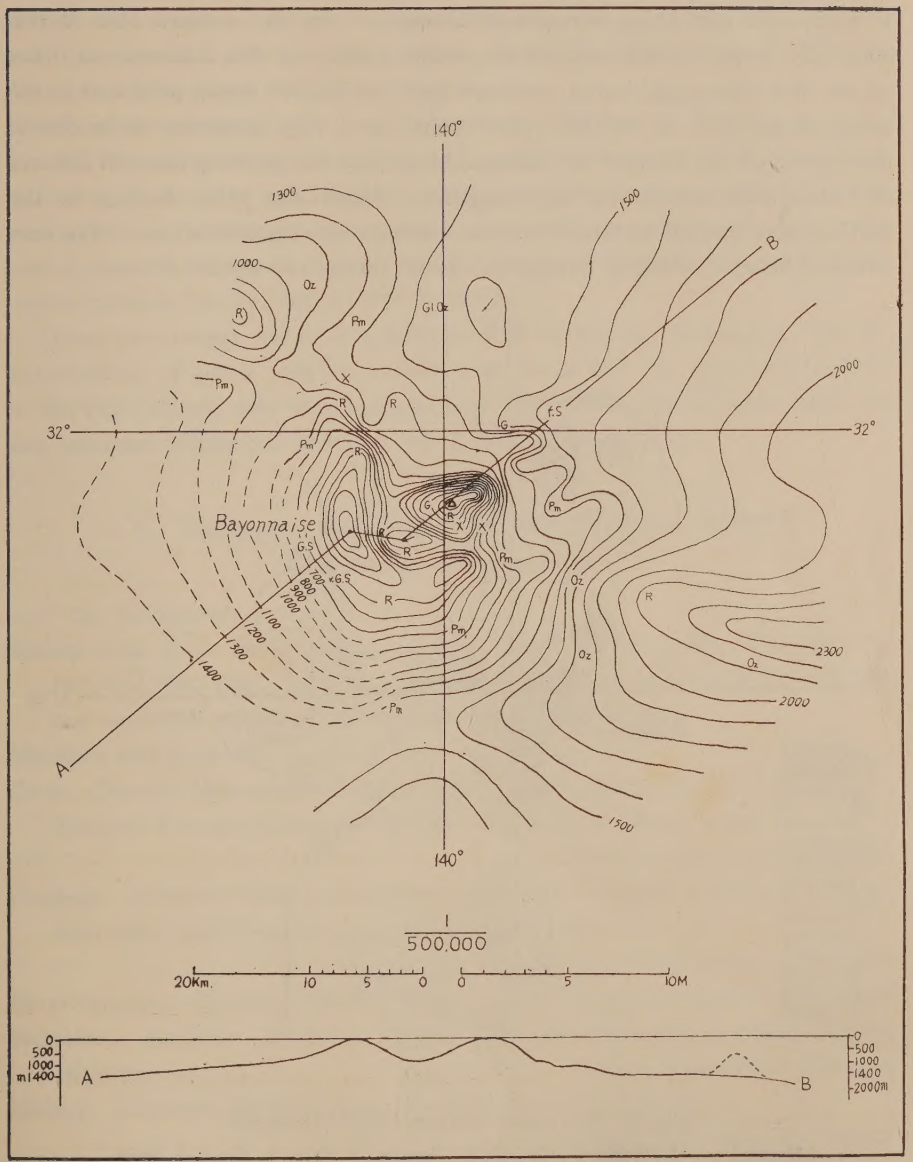


Figure 2. The bottom configulation around Myojin-sho.
(After Ryoichi MITA, Bulletin of Hydrographic Office Japan No. 12, 1949).

the 1,500 meter contour line encloses an elliptically shaped area measuring 25 km in south-north and 40 km in east-west directions. On the western side of this elliptically shaped area is situated Bayonnaise Island and with a diameter of 10 km on the line connecting, in the northern part, at the 197 meter point and in the south-eastern part, at the 380 meter point, is a ring mountain whose central part possesses the features of a large caldera, thus the geomorphological features of a large scale volcano can be recognized. Myojin-sho either belongs to the north-eastern summit of this submarine volcano, or to the central cone. The data obtained by echo sounding during the second survey are worthy of note.

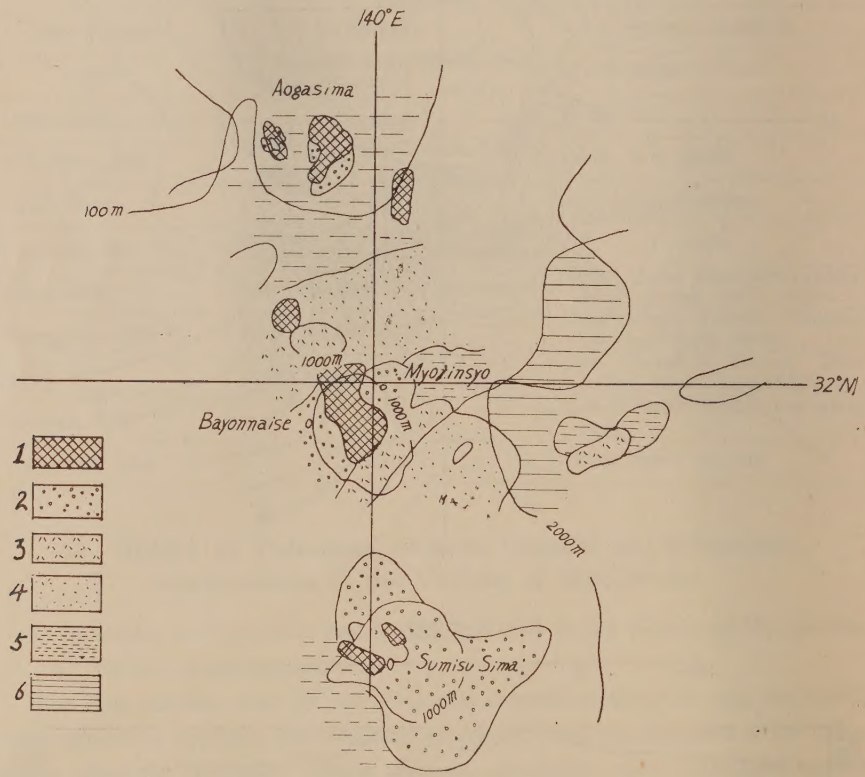


Fig. 3. The bottom character near Myojin-sho.
Regend:— 1—Rock, 2—Gravel, 3—Pumice, 4—Ooz, 5—Sand, 6—Mud.

b) Bottom material.

From the oceanographical chart No. 11, it is noticed that in the area between Bayonnaise Island and Myojin-sho, a bed rock is exposed, occupying an

area of 10 km in east-west and 20 km in north-south directions. On both sides of that area, sand and gravel are distributed and farther eastwards, in north-south direction and with a width of 10 km, pumice is spread, and still farther on the outer side is found volcanic sandy mud.

The Fuji volcanic zone in its general trend of north-south direction is arrayed with volcanic Island, which in the past as well as at present comprise ejecta consisting of alkalic or neutral rocks among which dark colored basalt or andesite predominate. However, in the south-east of Izu-Oshima where a branch of the zone exists, the Islands of Nii-jima, Shikine-jima and Kozu-jima consist of extrusive rocks as liparite, being acidic in nature.

From the present survey it was found that the pumice ejected from Myojin-sho consisted of quartz andesite. Thus, data concerning the magmatic activity of the Fuji volcanic zone has been obtained. In the bottom material from the seas surround Myojin-sho there are many description of corals.

3. Equipment and Method on the Occasion of the First Survey of Myojin-sho

1) Equipment.

Survey ship. S. S. Shinyo Maru, training ship of the Tokyo University of Fisheries, iron clad, 229 tons. Provided with Loran, echo sounding machine and apparatus sufficient for oceanographical observations.

Members and Subjects

Crew, Captain, Masayuki NAGAYAMA; Chief Officer, Hideo OTANI; Chief Engineer, Tamemi YAMASHITA, besides the crew of the S. S. Shinyo Maru
.....Tokyo University of Fisheries

Geodesy. Professor Takeharu KUMAGORI, Assistant Professor Yoshio YAMAGUCHI, Instructor Keiji YAMAMOTO, Assistant Hideo YAMAZAKI
.....Tokyo University of Fisheries

Oceanography. Professor Hiroshi NIINO .....Tokyo University of Fisheries

Fisheries. Assistant Professor Chiaki ARIHARA, Assistant Professor Yutaka IMAMURA .....Tokyo University of Fisheries

Biology. Professor Kenichi EBINA, Assistant Kazunori TAKAGI
.....Tokyo University of Fisheries

Volcanology. Professor Hiromichi TSUYA, Assistant Professor Ryohei MORIMOTO, Assistant Gôjo OSSAKA ....Earthquake Research Institute, Tokyo University

Oceano-chemistry. Professor Hiroshi HAMAGUCHI, Assistant Mitsunobu TATSUMOTO
.....Tokyo University of Education

Geology. Instructor, Hiroshi Ozaki, Instructor Michio Nakayama, Instructor Kazusuke Murata.....Tokyo Science Museum
Fisheries. Instructor Tomonari Matsushita.....Fisheries Bureau
Reporters. Messrs. Jitsuo Kusaka, Yoshimaro Oka and Yoshikatsu Sugano .....Asahi Press and Asahi Kagaku

Other members were Mr. Kiyoshi Inamura of the Setagaya middle school and Mr. Yoshiyuki Matsue of the Tokyo University. The later person took care of plankton hauling.

(2) Method of Survey.

On September 21, 1952 the training ship Shinyo Maru left Uraga Harbor, Kanagawa Prefecture at 5 am and due to high waves the ship reached Funato Bay of Miyake Island at 6 pm on the same day and harbored there overnight. On the 22nd at 2:30 pm the ship entered Horawazawa Bay of Hachijo Island. Here the reports concerning the eruption of Myojin-sho and the tsunamis were investigated at the Hachijo Observatory and at the Hachijo Fisheries Department. At 3 pm on the 22nd there was a sudden burst of low clouds over the sea southwards of Hachijo Island, which after ten minutes, cleared up. This suggested another eruption of Myojin-sho. Leaving Horazawa Bay at 7:15 pm on the 22nd, the ship headed southwards at a speed of 10 knots per hour and at 11:45 pm on the 23 at 83° south of Aogashima, a large fire column was seen on the dark sea, which lasted for 20 minutes.

At 4 am on the 23rd the vicinity of Bayonnaise island was reached and at 4:50 am a survey of Myojin-sho was begun. While cruising about 71° northeast of Bayonnaise Island, a yellow stream was found flowing and spreading in SSW direction in the blue sea. Following the current tide in northeast direction and along the yellow stream, two small rocks separated by about a distance of 200 meters were seen projecting above the yellow stream. These two isolated rocks were taken to be Myojin-sho, and two cruises were made around them during which time observation of position were undertaken. Cruising sonthwards along the eastern side of the yellow stream, observations of the land were made from in both the yellow stream and in the blue sea at 0–400 meters radius. During land observations, at 8:34 am, an eruption was seen from a distance, and after cruising 10 nautical miles southwards along the yellow stream, the ship again returned. Crossing the yellow stream and coming within 1.8 nautical miles on the eastern side of the volcano vent, there was a tremendous outburst at 1:12 pm. Bringing the ship to a position within 0.8 nautical miles the eruption was observed at 1:40 pm and oceanographical investigations were undertaken. Thereafter the ship headed towards Bayonnaise Island.

Reaching a position of one nautical mile south of Bayonnais Island (3.5 nautical miles from the site of eruption), both oceanographical observations and investigations of the fisheries was prosecuted. Completing investigations of the fisheries at 6:00 pm, the ship headed towards Hachijo Island, At 7:00 pm at a position observed as lat. 32° 04.2′ N., long. 139° 55.3′ E., about 7 nautical miles from the vent, a tremendous explosion was seen. The ship arrived at Horazawa Bay of Hachijo Island at 11:00 pm and reached Uraga Harbor at 5:00 pm on the 24th, after a successful period of observations.

4. Observations on the Eruption of Myojin-sho

a) Phenomena of the Eruption.

The position of Myojin-sho was plotted against Bayonnaise Island (lat. 31° 55.3′ N., long. 139° 54.5′ E.) using the Oceanographic Chart No. 81 as the standard. For reference the sextant method by employing Aogashima, Smith Island and Bayonnaise Island, with the Loran astronomical sextant was used. At 12:30 pm on the 23rd when within one nautical mile of the presumed point, two reddish-black rock masses separated by a distance of 200 meters were seen above sea-level, their height above sea-level was about one meter for the one on the eastern side and about five meters for that on the western. The rock on the eastern side showed no steam emitting, while on the northern part on the western side, yellow steam was vomitting into the air and sea. The temperature of this steam was about 30°C and it spread south-westards into the sea. The position of the rock on the western side was determined as lat. 31° 56.8′ N., long. 139° 59.5′ E. Since on both wings of the rocks projecting above sea-level there is a northward facing convexity and also because there is reason to believe that the rocks immediately below sea-level are spread in such arrangement, the diameter of the volcanic vent is assumed to be about 1 km and that the aforementioned rocks are representative of its southern margin.

As the sea area immediately above the center of eruption during the quiescent period consists of only small rock masses projecting above sea-level and with yellow steam emmiting in small quantitiy, it is believed that the greater part of the volcanic vent lies below sea-level and is generally covered with clear sea water in which even flying-fish are seen. If a vessel entered this area immediately before eruption, it is certain that it would be damaged by the submerged vent.

(2) Conditions during eruption.

That there were a total of six eruptions, two during night and four during

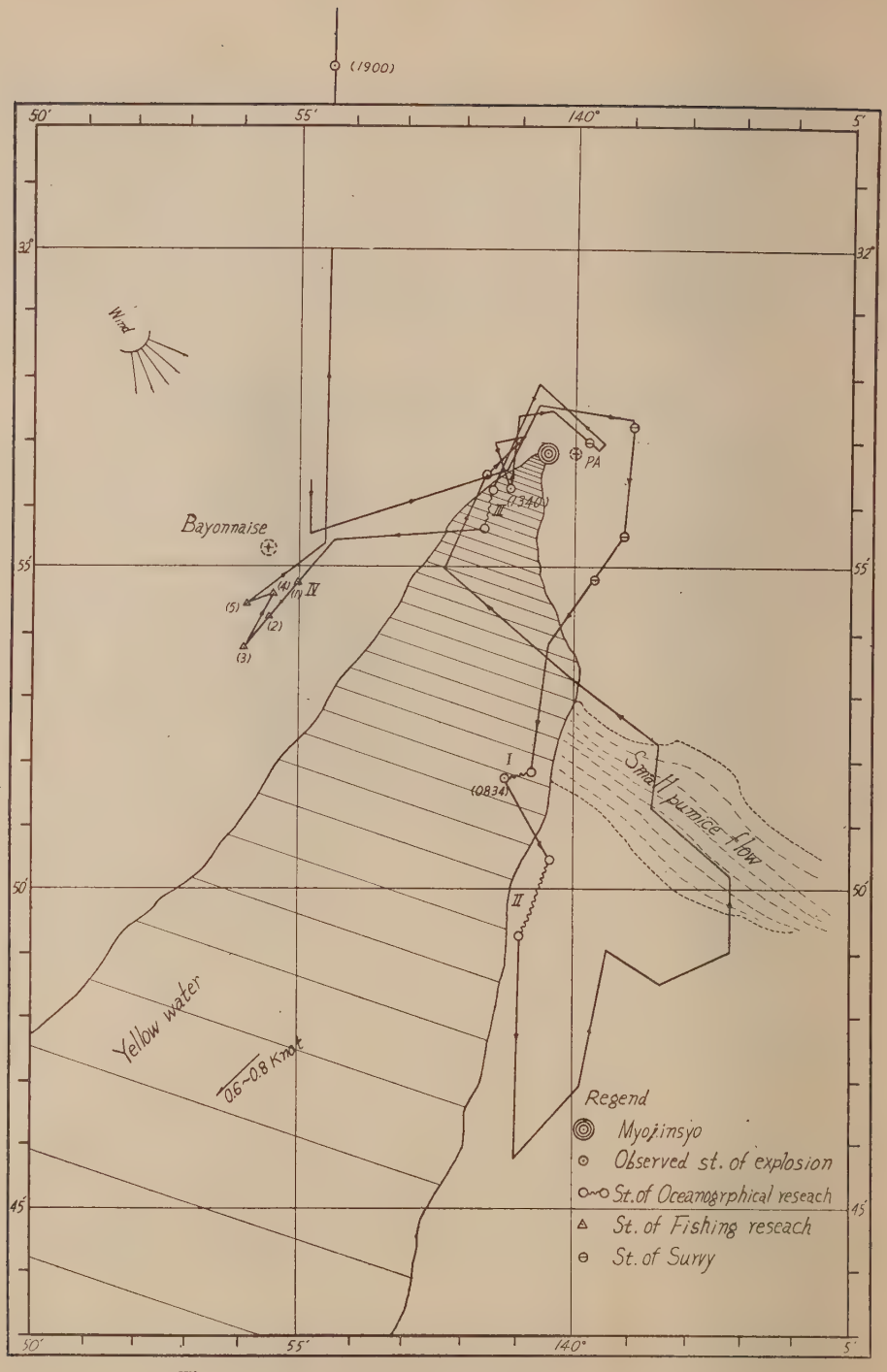


Fig. 4. The course of Shinyo-Maru around Myojin-sho.
(September 23, 1952)

Table II. The observation on the explosion of Myojin-sho, September 22-23, 1952.

Date of the observation		September 22, 1952		September 23, 1952			
		1	2	3	4	5	6
Time of explosion		15h 00m	23h 45m	08h 34m	13h 12m	13h 40m	19h 00m
Duration of severe explosion		Unknown	Unknown	3.5m	2m	2m	2.5 m
Duration of time through out explosion		,,	20m	30m	25m	25m	30 m
State of ejected pumice		,,	Unknown	Small piece, abundant	Large lump abundant	Large Lump Abundant	Unknown
Position of observation from crater		63 nautical m. off Hachijo I. 63 nautical m.	83, 9nm. off Aogashima I. 32 miles	31 51.7 N. 139 58.7 E. 5 miles	31 56.7 N. 139 58.4 E. 1 mile	39 56.2 N. 139 58.8 E. 0.8 mile	32 04.3 N. 139 55.3 E. 7 miles
Grade of explosion		Unknown	Unknown	Large scale	Medium	Medium	Large
Rise of the surface of the sea		,,	,,	Unknown	Slight	5 metres	Unknown
Sound		Nown	None	None	None	Roar	None
Shock		,,	,,	,,	,,	Feel shock	,,
Tsunami wave	Length	Not observed	Not observed	Not observed	Not observed	About 50 m	Not observed
	Hight	,,	,,	,,	,,	About 2 m	,,
	Period	,,	,,	,,	,,	Unknown	,,
Diameter of the explosion center		Unknown	Unknown	About 1000m	800 m	600 m	Unknown
Time of tide		Low : 12h 55m	High: 18h 45m	High :7h 45m	Low : 13h 25m	Low : 13h 25m	High : 19h 05m
Grade of Weather		B	B	B	B	C	B
Pressure		1012 mmb.	1013.5 mmb	1014.5 mmb	1014.0 mmb	1014 mmb	1014.5 mmb
Direction of wind		WNW	NW	NW	NW	NW	NE
Strength of wind		3	2	2	2	2	2
Grade of wave		2	2	3	2	2	2
Eye field		Good	Good	Good	Good	Good	Good
Swell		None	None	None	None	None	None
Temperature of air		23.5°C	24.5°C	25.0°C	24.5°C	24.5°C	24.5°C
Temperature of sea water		27.6°C	27.2°C	27.8°C	27.7°C	27.7°C	26.0°C
Remark		Observed from Hachijo Island	At night, off Aogashima	In yellow stream	At the east side of crater	Run into danger	North of Bayonnase rock

day time, is shown in the annexed table. At the begining period of eruption no early waring could be observed from the ship. At the time of eruption, first the sea water beings to upwell, then an explosion occurs followed succession by enclosing vapour in which center a mushroom-like cloud suddenly raises. From this there is a down-pour of pumice and volcanic ash. The explosion clouds within 10 to 15 minutes reach a height of about 6,000 meters and in about 20 to 30 minutes the clouds disappear completely. Immediately after eruption there was no evidence for concluding that, the sea area in the vicinity of the vent is either crowded with floating pumice or the emmitting yellow steam becomes stronger, Owing to the fall of pumice and volcanic ash the sea water became turbid and unlike the yellow steam emmitted from the vent, the pumice and ash

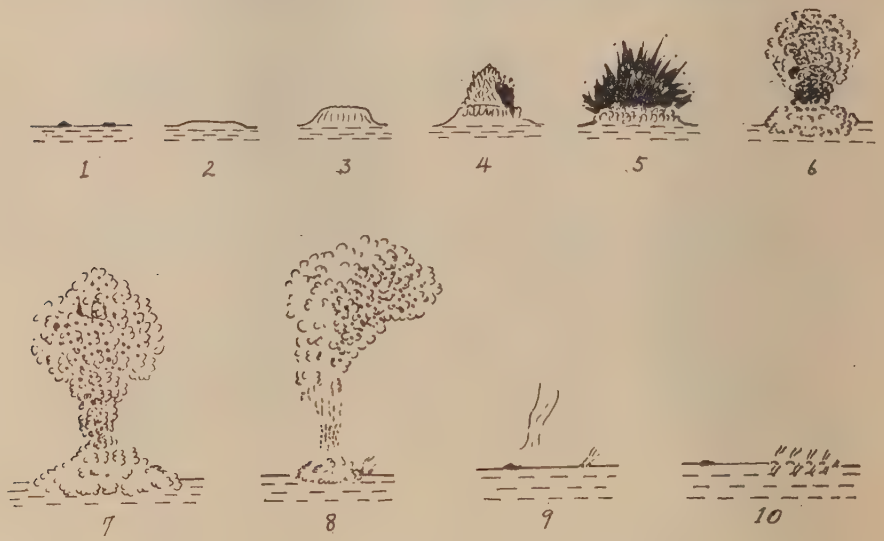
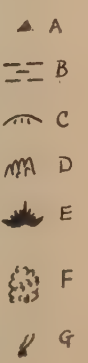


Fig. 5. Diagramatic skeches of explosion which produce change of shape by lap of time.
A—Rock, B—Sea water, C—Dome of water, E—Explosion of volcanic ash., F—Volcanic ash and vapore, G—Drift pumice.



constructed their own stream in the blue sea water and were carried by aid of the wind to flow in a different direction. During night a fire column is seen within the center of eruption and this is a beautiful sight.

a) Description of daytime explosions.

The following is a description of a daytime explosion observed from a distance of 0.8 nautical miles from Myojin-sho.

At 1:00 pm on September 23, 1952 when the ship was stopped at a position of 27° or 1,500 meters distant from the center of eruption to make details observations, an explosion occurred at 1:12 pm. During this explosion the ship was forwarded into the sulphur stream to collect fresh pumice samples just thrown into the sea and the ships engine was stopped at a distance of 1500 meters from the center of eruption. At this time when the men were leaning over the ships side to collect pumice samples, suddenly the sea in the right front of the ship swelled up in dome-shape. This dome measured about 200 meters in width and ap-

Table III. Observation on the eruptive cloud from Myojin-sho.

1. Explosion of 8h 34m, September 23, 1952.

Time passes after the beginning of explosion	40 s	1m 30s	2m 30s	3m	3m 30s	5m	8m	13m
Wide of eluption cloud at the surface of sea	1000 m	1500m	1700m	2200m	2200m	1500m	1200m	Vapour
Hight of eruption cloud from the surface of sea	500 m	600m	750m	1200m	1300m	1800m	6700m	only
Shape of the eruption cloud	dome	dome	Pyramid	Pyramid	Mush-room	ditto	ditto	
Remark								Fall of pumice

2. Explosion of 13h 12m, September 23, 1952.

Time pass after the beginning of explosion	50s	1m 20s	3m 30s
Wide of eruption cloud at the surface of sea	300m	1100m	1000m
Hight of eruption cloud from the surface of sea	600m	600m	1000m
Shape of the eruption cloud	Pyramid	Reverse	Mushroom

3. Explosion of 13h 40m, September 23, 1952.

Time pass after the beginning of explosion	5s	30s	1m	3m
Wide of eruption cloud at the surface of sea	600m	1400m	2000m	Observation impossible
Hight of eruption cloud from the surface of sea	250m	500m	?	
Hight of the dome of water	30m			

proximately 5 meters in height, and almost simultaneously it broke into saw-edge for about 30 meters. At this time a water column, dark gray in color, rose out of the sea like a devil and the sea surface was covered with steaming vapour. The water column then broke in radial form and at its margin was found numerous pumice blocks and volcanic bombs. From the top of the black cloud could be seen flashes of lightening, This lasted for about ten seconds, then after the black smoth, especially its central part rose very rapidly in mushroom-shape. The sea surface for a diamter of about 800 meters was covered with steaming escaping vapour and white smoke, and about 50 seconds later the explosion smoke turned to pyramid shape aud its height was about 600 meters. The sea surface around the volcanic vent was covered with falling pumice, water columns and steaming vapour, making the entire area appear like white smoke. Immediately after the explosion rumbling noises and air currents could be felt but there was no feel of vibration from the ship as a result of the outside forces. Being in the critical area of explosion the ship begnn to turn to a more safe place to continue observations, and during this procedure tunamis with a wave length of 50 meters and height of two meters attacked the ship several times. The time required to make a complete mushroom shape cloud was 2.5 minutes and the topmost part of the complete mushroom shaped cloud reached a hight of 8,000 meters 7.5 minutes later. Since the ship was on the wind-ward side of the explosion no pumice or ash fell on it, but from the exposion clouds which floated in northeast direction, there could be seen small pumice blocks and volcanic ash falling in the conditions as would a sudden rain pour or rain when seen from a distance. For an area within 700 meters of the vent, the pumice fell vomitting vapour.

15 to 16 minutes after the explosion the white smoke caused by vapour became faint and 20 minutes later, in the central part of the vent, the spouting vapour rose in spiral form to a height of a bout 20–30 meters. In the vicinity of the vent were seen enourmous size pumice blocks vomitting vapour like white smoke as they floated as columns at a velocity of about 1 nautical mile per hour with the current, The large size pumice blocks measured about 5 meters in height. The different pumice blocks bumped into each other when floating and on this occasion there was a sudden outburst of vapour which appeared like white smoke. Floating farther away from the vent, this columnar pumice began to disintegrate and become isolated blocks though still arranged as a large mass. 25 minutes after the first explosion the explosion smoke in the sky was completely destroyed, The 2–5 mm small pumice blocks which fell from the sky formed their own stream and flowed in a direction different from that of the yellow stream. The vent immediately after the eruption can be judged by the fact that

the small rock mass on the eastern side was completely blown away by the explosion.

The explosions which occurred at 8:34 am, 1:12, 1:40 pm were all like the one described above in this characteristics, At 9:35 am there were two smoke columns and at 1:15 pm there was only one in the vicinity of the volcanic vent; however, details are unknown.

b) Conditions of night eruption.

The following is a description of a night eruption which took place at 7:00 pm on the 23rd of September at Lat. 32° 04. 3′ N., Long. 135° 55.3′ E., at a distance of 7 nautical miles from the explosion. Two night eruptions were experienced but only one will be described herein.

In the black night there was a sudden flash of light across the sea surface then like fire-crackers volcanic bombs began to be hurled into the air, at this time a straight, very large, column of red fire rose straight upwards into the air and explosion clouds began to form. At this time, between the sky and aforementioned smoke, a purplish-red colored lightening occurred several times and mushroom like clouds could be seen against the sky. Continuously against the sea-level line could be seen several splashe of red which gradually became fainter and after 15 minutes the conditions again seemed to return to normal. There seemed to be no tsunamis, rumblings or vibrations.

(3) Volcanic ejecta.

The pumice floating in the water near the volcano vent were hauled to the ship deck at 2:10 pm. These measured about 70 cm in diameter, were grayish white in color with their surface bread-like, being porous and crumbled very easily. Their inner side was rather compact, When these were hauled to the ship deck they were broken with a hammer and they were so hot that they could not be held by the hand without receiving a burn. Under the microscope the pumice was found to consist of natural glass needles interbedded with quartz, feldspar, pyroxene, purplish pyroxene and etcetra, thus it was determined as quartz andesite.

Within the large pumice blocks were found black colored particles, which seemed to be nothing but volcanic ash.

According to Professor Hiroshi Hamaguchi, a chemical analysis provided the following to be present, namely: SiO_2 68.84 percent, TiO_2 0.47 percent, Al_2O_3 14.68 percent, FeO_3 2.16 percent, FeO 25.8 percent, MnO 0.12 percent, MgO 1.29 percent, CaO 5.11 percent, Na_2O 3.88 percent, K_2O 0.63 percent, P_2O_3 0.11 percent, amounting to 99.87 percent in total.

b) Survey on the Materials Extruded from the First Eruption.

A BRIEF NOTE ON THE PETROGRAPHY OF THE PUMICE EJECTED FROM MYOJIN-SHO (REEF), NEAR THE BEYONNAISE ROCKS, SEPT. 23, 1952

Hiromichi Tsuya, Ryōhei Morimoto and Gojo Ossaka

(Earthquake Research Institute, Tokyo University)

The floating block of the pumice ejected from Myojin reef was collected in in hot state soon after the severe submarine explosion of 13h 12m (Japan standard time), during the present investigation. The specimen, estimated roughly 30 cm × 40 cm × 100 cm in size, is white pumice in which the crystals of quartz, plagioclase, and pyroxene are megascopically found, The matrix of the rock is mainly composed of porous glass with pearly lustre, which is quite acicular in the drusy portions of the rock. The brittle short acicular volcanic hairs with minute grains of pumice were suspending in the sea water stained into yellowish colour owing to the volcanic dusts ejected from the submarine volcano.

Petrographically, the rock is two pyroxene quartz-dacite in which porpyritic crystals of andesine, high quartz, hypersthene, augite, and iron ore are scattered in porous glassy groundmass. One of the most remarkable fact to be pointed out of the rock is its heterogeneous petrographic feature of the pumice. Greysh or light greysh patches of various size, from several cm to several mm or further to microscopic in dia., are contained sporadically in the white dacite-pumice. The patches are dolerites, andesites, dacites, and aggregates of the crystals early separated from the magma concerning with the present activity. The former two may have been detatched from the channel walls. Some light greysh minute patches are slightly compact dacite fragments, whose petrographic characters are similar with those of the dacite found in the barrel used on the "No. 5 Kaiyo-Maru[1]). These dacite fragments may be of same origin with the surrounding dacite pumice, Minute crystals of olivine always fringed by the deleritic groundmass are often found in the thin slices of the compact dacite under the microscope. Such olivine crystals and some of the pyroxene crystals are the xenocrysts derived from the disintegrated pre-existing volcanic rocks through which the present dacite magma was extruded. Porphyritic crystals of quartz with cor-

1) Broken woods of the boat were injected by many minute fragments of the compact dacite, altered andesite, crystals of hypersthene, which show that the boat was attacked by the explosion of the reef.

roded forms are predominant in the porous glassy part forming the main portion of the collected dacite-pumice. Crystals of quartz apparently found in the above-mentioned greysh patches are almost always associated with the thin films of porous glassy groundmass which indicate the embayment of dacite magma into pre-existing rock fragments. The above-mentioned petrography of the dacite pumice ejected at the submarine explosion 13h 12m, Sept. sufficiently show that the dacite magma concerning with the explosion was contaminated remarkably by the pre-existing volcanic rocks forming the submarine volcano. The conspicuous existence of the accessory inclusions in the pumice represent the incomplete contamination in the magma. Such an incompletely contaminated dacite as the pumice from Myojin reef are commonly found at the domes forming central cones or parastic cones of the caldera volcanoes of Krakatau types[1]), According

Table IV.

Constituents	1	2	3
SiO_2	68.23%	65.39%	63.30%
Al_2O_3	14.31 〃	14.99 〃	16.10 〃
Fe_2O_3	1.75 〃	1.98 〃	3.13 〃
FeO	2.92 〃	3.15 〃	3.80 〃
MgO	1.51 〃	1.47 〃	2.77 〃
CaO	4.51 〃	5.27 〃	6.12 〃
Na_2O	3.90 〃	3.69 〃	2.67 〃
K_2O	0.75 〃	0.63 〃	0.51 〃
$H_2O(-)$	0.37 〃	0.81 〃	0.52 〃
$H_2O(-)$	0.18 〃	0.67 〃	——
TiO_2	0.59 〃	0.70 〃	0.79 〃
P_2O_5	0.10 〃	0.14 〃	0.13 〃
MnO	0.08 〃	0.10 〃	0.18 〃
NaCl	0.53 〃	0.63 〃	——
S	0.12 〃	n. d.	n. d.
Total	99.85%	99.62%	100.02%

1. Main white portion of the pumice ejected 13h 12m, Sept. 23, 1952, from Myojin reef· Anal. G. Ossaka.

2. The pumice found in the barrel of No. 5 Kaiyo-maru, Marin Safety Agency. The rock seems to be ejected from Myojin reef, Sept. 24, 1952. Anal. G. Ossaka.

3. Greysh patches included in the above-mentioned white pumice ejected from Myojin reef 13h 12m Sept. 23, 1952. The test piece was washed with distilled water before analysis and was heated at 110°C in air bath. Anal. G. Ossaka. The writers owe much to the students of the Tokyo College of Pharmacy for their kind assistances in the analyses. Strictly, the results of the analysis shows the average composition of the patches embayed by a little surrounding pumice, as was indicated in the above mentioned petrography. In the same way, the acid magma relating with the eruption must be slightly more acidic than the result of 1. Composition of 2 is an intermediate one between 1 & 3.

1) H. Kuno, "Formation of Calderas and Magmatic Evolution." Trans. Amer. Geophys. Union **34** (1953), No. 2, pp. 267-280.

to H. Niino, pumice had been dredged from the sea bottom near the Beyonnaise rocks at his former investigation. Calderas of Krakatau type are characterized by the paroxy small ejection of pumice at the collapse of calderas. Further detailed investigations are needed to survey the submarine topography of the volcano and to collect the rocks of the sea floor including the rock of "Beyonnaise rock". In conclusion, the writers' sincere thanks are due to Dr. H. Niino of the Tokyo University of Fisheries for their excellent management of the present investigation. The writers' thanks are also due to the staff of Shinyo Maru for their kind assistance during the investigation.

5. Oceanographical Observations in the Vicinity of Myojin-sho

a) General Oceanography. The weather on September 23, 1952, the day of observation was clear, the atmospheric pressure 1013.5—1014.5 mmb, wind velocity 2, wind direction NW, temperature 24.5°C—25.0°C, wave crest 3—2, no undulation of waves, distance of sight very good, and the sea current velocity was measured as 1.0—0.8 knots per hour and in southwest direction.

At 4:50 pm on September 23, 1952, at a point 71° from Bayonnaise Island, a yellow stream was found flowing within the clear blue sea water, and from the floating materials within the stream, it was found that its velocity was 0.6 knots per hour and in SSW direction. The yellow stream was olive yellow in color according to the Wada color indicator No. 4. This stream was followed to determine its origin, Turning around eastwards from the north the ship traveled about 5 knots southwards and at 7.38 am at a point lat. 31° 51.8′ N., long. 139° 59.2′ E., oceanographical observations were undertaken at the depth of 0—400 meters; this observations was completed at 8:45 am at Lat. 31° 51.7′ N., Long. 139° 58.7′ E. On the western side of the stream similar observations were carried out, commencing at 9:40 am at Lat. 31° 50.7′ N., Long. 139° 59.5′ E., and completing the same at 10:28 am at Lat. 31° 49.2′ N., Long. 139° 59.0′ E. Then after heading southwards several times, the ship again headed for the volcano vent.

The boundary between the yellow stream and clear blue sea was like a saw-edge and the intermixed water could be observed both horizontally and vertically.

In the yellow stream were found *Diodon holacanthus* Linné *Monacanthus cirrhifer* Temminck and Schlegel *Diaphus coeruleus* (Klunzinger) and other shoal fish as well as deep sea fish in the condition of half dead or paralyzed due to being brought up from the deep, and near the boundary of the yellow stream and clear blue sea water was found a more than two meter long *Sphyrna zygaena* (Linné) swimming near the surface.

The yellow stream was crossed at a point 4 knots from the volcano vent. This yellow stream contained much material as it was turbid as could be judged from the fact that the screw of the ship could be felt to receive the resistance, that the clear sea water laid below the yellow stream was proved by the fact that it upwelled owing to the surging caused by the ship screw.

After the explosion at 1:40 pm, at 2:52 pm about 2 knots down stream from the site of explosion at a point calculated as Lat. 31° 56.2′ N., Long. 139° 58.4′ E., oceanographical observations were begun. These observations were completed at 3:37 pm at Lat. 31°55.3′ N., Long. 139° 59.1′ E. Besides the above, observations were also made in the fishing grounds in the vicinity of Bayonnaise Island.

The clear blue sea water temperature was in the region of 27. 5°C, the water color 2—3, transparency about 30 meters, salinity above 34‰ and the pH measured 8.3 or thereabout; while the transparency of the yellow stream was 1.6—3.0 meters, its water color could not be measured by Forel's scale and the pH was 7.5. The thickness of this yellow stream is within 25 meters, thus it is not very thick and that the blue sea water lies underneath can be seen from the annexed table. That the quantity of the volcanic ejecta has but little influence was thus proved. The origin of the yellow color, as will be noticed from Professor Hiroshi Hamaguchi's analysis is due to the intercalation of volcanic ash and not to sulphur which was found to be contained in only 0.3—0.4 mg/L. Further, there was no particular smell of sulphur. Plankton nets were hauled in this yellow stream and its was found that the greater majority were all dead.

From the above-mentioned facts it is clear that this sea area is controlled by a subbranch of the Kuroshio current and the turbid water due to the intercalation of volcanic ejecta is recognizable only within about 30° radius of the volcanic vent. This stream is not thick as would be expected and the plankton and fishes in its vicinity do not seem to have received any noteworthy influence by its turbidness.

b) CHEMICAL INVESTIGATION ON THE SEA WATER AND THE PUMICE STONE

Hiroshi HAMAGUCHI and Mitsunobu TATSUMOTO
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The water was collected at three stations (Fig. 4) during our exploration. These are:

St. 1: Stained olive being affected by volcanic activity, color of water is over No. II by Forel's number. Transparency is 3 meters.

St. 2: Not affected by volcanic activity, color of water is No. 2 by Forel's number (ultramarine). Transparency is 30 meters.

St. 3: Stained orange-yellow being affected by volcanic activity, color of water is over No. II by Forel's number. Transparency is 1.6 meters.

The results of the chemical research on the above waters are shown in Table V.

Table V. Results of the chemical research on the sea water.

St. No.	Depth (m)	Temp. (°C)	Chlorinity (‰)	Salinity (‰)	Oxygen (cc/l)	Oxygen o_2/o_2'(%)	Boron (mg/l)
1	0	27.8	18.90	34.14	n. d.		4.30
	10	28.1	18.95	34.23	3.95	84	4.17
	25	27.4	18.83	34.02	4.86	102	4.63
	50	26.2	19.13	34.56	n. d.		n. d.
	100	24.0	19.24	34.76	n. d.		n. d.
	200	18.8	19.26	34.79	n. d.		n. d.
	400	16.4	19.20	34.69	4.58	80	5.65
2	0	27.5	18.86	34.07	4.82	104	n. d.
	10	27.5	18.93	34.20	4.80	101	4.31
	25	27.2	18.95	34.23	4.82	101	4.66
	50	24.3	19.14	34.58	4.63	93	4.44
	100	21.9	19.27	34.81	5.06	97	4.57
	200	19.9	19.19	34.67	4.66	85	4.44
	400	17.0	19.27	34.81	4.77	85	5.11
3	0	28.2	18.67	33.73	4.87	104	3.90
	10	28.2	18.74	33.86	4.42	94	4.13
	25	27.7	18.99	34.31	4.65	99	4.44
	50	25.8	19.16	34.61	4.75	98	4.44
	100	24.1	18.88	34.11	4.73	94	4.31
	200	19.3	19.10	34.51	4.93	91	4.44
	400	17.2	18.99	34.31	4.73	84	4.44

Station 1. Beginning of observation. 31°51.8′ N, 139°59.2′ E. 7h 38m
The end. 31°51.7′ N, 139°58.7′ E. 8h 45m
About 5 nautical miles from crater.

Station 2. Beginning of observation. 31°50.7′ N, 139°59.5′ E. 9h 45m
The end. 31°49.2′ N, 139°59.0′ E. 10h 28m
Out side of the yellow stream near Station 1.

Station 3. Beginning of observation. 31°56.2′ N, 139°58.5′ E.
The end. 315°5.3′ N, 139°59.1′ E. 15h 37m
About 3 km. from crater, in the yellow water.

If we compare the waters of station I and 3 with that of station 2, we recognize that the temperature of the former at zero and ten meters depth is slightly higher than the latter. The oxygen is saturated within the range of 25 meters depth at station 2, while at station I and 3 it is abruptly unsaturated at 10 meters depth.

Considering on the above facts it comes to this conclusion that the effect of volcanic activity extends only to the surface water, and the water deeper than 25 meters is entirely unaffected by this activity.

The colored suspensoids in the turbid water were determined to amount to 3～30 mg per litre. Because this suspensoid contained only traces of sulphur, it is supposed to consist mainly with volcanic ashes.

The pumice stone which was evolved on the occasion of the eruption contained some black xenolith and had a white appearance. It was judged to be "two pyroxene quartz andesite" by thc mineralogists who had gone with us. It's bulk chemical composition is shown in Table VI.

Table VI. Chemical composition of the pumice stone

SiO_2	68.84%
TiO_2	0.47
Al_2O_3	14.68
Fe_2O_3	2.16
FeO	2.58
MnO	0.12
MgO	1.29
CaO	5.11
Na_2O	3.88
K_2O	0.63
P_2O_5	0.11
Total	99.87%

c) Plankton.

THE FEATURE OF THE PLANKTON FOUND IN THE SURROUNDING AREA OF MYOJIN-SHO

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The following is a report of our study made on the plankton samples collected during the Myôzin-Shô Expedition by the investigation ship, Shinyô-Maru, in the surrounding area of Myôzin-shô. In disclosing the result of our study, our thanks are due to Dr. Niino, Director of the expedition, for giving us a chance to observe these materials.

METHOD

Quantitative plankton collections were made at four stations by Marukawa's closing net (30 cm in mouth diameter and mesh size XX-13, equivalent to No. 20 of bolting silk number). The net was hauled at station 1, from the depth of 200 m and of 100 m vertically to surface, And then before and after these vertical collections, horizontal catchings were made in surface layer. On the other hand, at station 2, 3 and 4 the net was hauled vertically in each layer of 200–100 m, 100–50 m, 50–0 m, and no horizontal catching was made.

The plankton material were examined quantitatively; their displacement volume and individual number were determined, As materials collected at station 3 were mixed with voluminous pumice frangments so that plankton were separated from them thoroughly by picking out one by one with needle and pipette.

GENERAL FEATURE OF THE PLANKTON

Results of the displacement volumes and the individual numbers obtained on each plankton sample is shown in Table VII.

Communities of the plankton collected showed purely zooplanktonic and *Copepoda* was the most prominent with species of a great number, and so onr quantitative examination was limited on the animal species alone. The enumeration of individual numbers on each zooplankton species was made, but the table showing the result was not given in this report.

In discussing of the plankton feature at the region, our first attention should be paid upon the plankton samples collected at station 3, which was the observation point situated the nearest to the crater and was amidst the area heavily discolored by the erupted substance from Myozin-sho. It was at this station that

large amount of pumice fragments were collected mixing with plankton in every layer hauling.

Dr. NIINO reported us that, on board the ship, when plankton samples were hauled at the discolored area, many macro-zooplankton were observed to be perished macroscopically.

Table VII show us that comparatively large amount of zooplankton were distributed in the region at that time, but evident decreasing of plankton organisms is found in the discolored area. The individual numbers and the displacement volumes of the plankton at station 3 gave us the values of 4335 ind. and 1.9 cc respectively, both of which are less than half of those values obtained at other stations.

The displacement volume of plankton in 100–50m layer at station 2 showed the largest value (3.3 cc/50 m haul), and the smallest in 200–100 m layer at station 3 (0.3 cc/50 m haul). The total number of individuals were the largest in 50–0 m layer at station 4 (4406 ind./50 m haul), and the smallest in 200–100 m layer at station 3 (746 ind./50 m haul). Although station 1 was situated in the discolored area, the figures gained at this point did not differ largely from those of other stations.

Fixed plankton materials of station 3 had colors of yellowish-brown, brown or gray and included some shrinked or collapsed organisms. Similar feature was observed on the samples of station 4 also. The damaged plankton were mainly those large formed species having weak body structure such as *Sagitta*, *Oikopleura*, *Salpa*, *Medusae*, *Eucalanus*, *Calocalanus*, *Haloptilus* and *Copilia*.

The materials of station 1 and 2 did not show any abnormal appearances.

(1) COPEPODA

As stated above *Copepoda* was the most prominent species through all the stations and layers. The percentages of *Copepoda* to the total number of individuals of zooplankton showed the values of 66.5—84%. 10 genera including 101 species of them were identified by us.

The prominent species through all of the four stations are as follows; *Calanus darwinii*, *C. tenuicornis*, *Eucalanus attenuatus*, *E. mucronatus*, *Euchaeta longicornis*, *E. marina*, *Scolecithrix danae*, *Copilia mirabilis*, *C. quadrata*, *Setella gracilis* etc.

Such species as *Calanus pauper*, *Clausocalanus arcuicornis*, *Paracalanus aculeatus* and *Corycaeus gibblus* could be hardly observed at station 3, especially in the layer lying deeper than 50 m. This applies to *Mecynocera clausi* also, but it did not appear at station lat all.

Sapphirina gave 9 species and *Candacia* 10 species, but they were very scarce in number. In the layer lying deeper than 50 m at station 3, *Haloptilus longicornis* was less prominent than at other stations. *Pseudocalanus gracilis* appeared more often at station 1 and 3 than at other stations. *Eucalanus* was most often seen in 100–50 m layer at station 3, *Microsetella sp.* was found only in materials obtained by horizontal catching at station 1,

Table VII. Plankton taken from surrounding area of Myozin-sho.

(St-1) Hauled layer (m)	200-0		100-0	
Displacement vol. (c.c.)	3.6		3.2	
	Numb.	%	Numb.	%
Total zooplankton	1700		2963	
Copepoda	1410	82.9	2234	75.4
Zooplankton other than Copepoda	290	17.1	729	24.6

(St-2) Hauled layer (m)	200-100		100-50		50-0	
Displacement vol. (c.c.)	1.4		3.3		1.3	
	Numb.	%	Numb.	%	Numb.	%
Total zooplankton	1055		3299		3343	
Copepoda	802	76.0	2653	80.4	2659	79.5
Zooplankton other than Copepoda	253	24.0	646	19.6	684	20.5

(St-3) Hauled layer (m)	200-100		100-50		50-0	
Displacement vol. (c.c.)	0.6		0.9		0.4	
	Numb.	%	Numb.	%	Numb.	%
Total zooplankton	740		1404		1451	
Copepoda	622	84.0	934	66.5	1169	80.6
Zooplankton other than Copepoda	118	16.0	470	33.5	282	19.4

(St-4) Hauled layer (m)	200-100		100-50		50-0	
Displacement vol. (c.c.)	1.1		1.1		2.2	
	Numb.	%	Numb.	%	Numb.	%
Total zooplankton	1365		2951		4406	
Copepoda	1037	76.0	2258	76.5	3620	82.2
Zooplankton other than Copepoda	328	24.0	693	23.5	786	17.8

* Numbers of individuals of plankton are calculated for number per 50 m haul.

Table VIII. Quantities of Pumice-fragments in materials at station.

Layers	200-100 m	100-50 m	50-0 m
Volume cc.	2.2	16.0	3.7
Dry Weight gr	0.6	2.8	0.7

(2) ZOOPLANKTON OTHER THAN COPEPODA

Sagitta, *Salpa*, *Oikopeura* and *Cypridina* showed prominent appearance at each station, and next come Mysis-Larva and Polychaeta-Larva. *Lucifer* could not be seen at station 3. In 100–50 m layer at station 3, larger forms of Polychaeta—*Tomoptelis*, *Callizona* and *Vadis* etc.-were more conspicuous that at other stations.

(3) PHYTOPLANKTON

Few phytoplankton species as followings, though very small in number were identified: *Chaetceros coarctatus*, *Rhizosolenia styliformis v. latissima*, *Rh. cas. tracanei*, *Ceratium tripos*, *C. macroceros*, *C. sumatranum*, *Phaeocystis sp.* and *Trichodesmium sp*,

(4) PUMICE FRAGMENTS

The pumice fragments which were collected mixing with plankton at station 3 were measured of their volumes and dry weights, the values of which are given in Table VIII. The longest calibres of the fragments ranged between 0.5 mm and 6 mm.

6. Fisheries Survey in the Vicinity of Myojin-sho

a) Fishing ground.

(1) Vicinity of Myojin-sho. In the vicinity of the volcanic vent of Myojin-sho there were seen living flying fish and dead specimens of nearly shoal or deep sea fish were also floating but no dead pelagic fish could be seen.

(2) Condition of fisheries in the vicinity of Bayonnaise Island. In the vicinity of Bayonnaise Island *Trachurops crumenophthalmus* (Bloch) could be seen skipping on the sea surface, being chased by *Thynuus orientalis* (Temminck and Schlegel). On the 23rd at 3:30 pm about 1 knot southeast of Bayonnaise Island deep sea wire fishing was done five times, and the fishing ended at 5:55 pm.

Fishing method: By the use of an electric sounding machine, wire as shown in the annexed figure, the hook was left for about 2–5 minutes after reaching bottom and thin it was hauled up at the rate of 100 meters/4–5 minutes; the bait used was cold storage *Cololabis saira* (Brevoort), cut in suitable sizes. Fishing was done at depths of 73—260 meters, five times; this depth the bottom of the banks was reached. Owing to the prevailing wind the movement of the ship was considerable and accordingly the depth of the water also showed considerable variation. However, the catch of fish was good. Thus it is found that there was no effect on the bottom fishing grounds in the vicinity of Bayonnaise

Island and also that both the bottom fishing grounds and the substratum grounds are still useful as a good grounds. The volcanic eruption of Myojin-sho seems to have had no effect upon the fishing grounds in the vicinity of Myojin-sho.

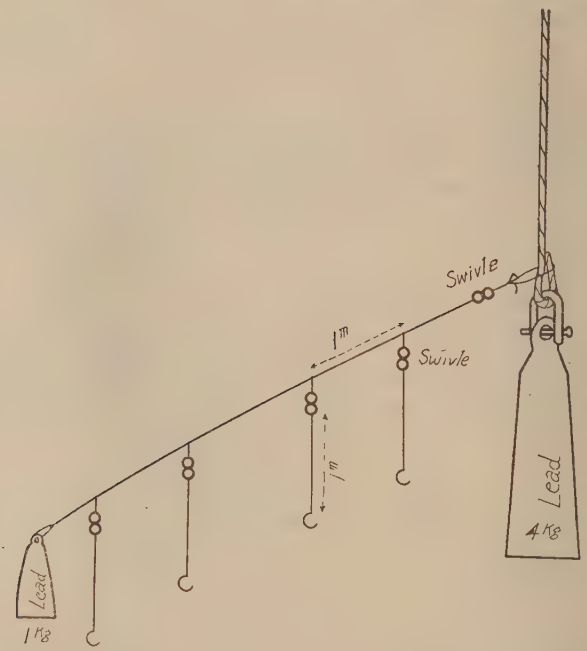

Fig. 6. Fishing tool of bottom fish. By the use of electric sounding wire.

Table IX Fishing experiment near Bayonnaise rocks.
(14h 20m–17h 55m, September 23, 1952)

	1	2	3	4	5
Azimuth, distance from Bayonnase	142, 0.7nm	184, 1.0nm	194, 1.6nm	176, 07nm	200, 1.0nm
Depth (metre)	73m	85m	260m	80m	182m
Bottom character	Rock	Rock	Rock	Rock	Rock
Hooks	7	7	7	6	6
Effective hocks	3	4	3	5	6
Uneffective hooks	4	3	4	1	—
Effective time (minute)	10m	5m	5m	2m	3m
% of capture	33	25	100	60	0

b) Kind of fishes.

REPORT ON THE LANTERN FISHES COLLECTED BY SHINYO-MARU AT MYOJIN BANK NEAR HACHIJO ISLAND, JAPAN

At the visitation to the Myojin-sho which is newly formed by the explosion happened of late. We obtained the drifting lantern fishes and other ones which were believed to have been killed by the eruption of the volcano and we studied on them. The result may by appeared in the following lines.

Fam. *Myctophidae* (Lantern fish)

Macrostoma pusillum (Johnson) Jap. name "Myojin-hadaka" Pl. XXIII, Fig. 1.

Lampanyctus pusillus Roule and Angel, 1933 (between Madeira and Azores, 3500 m)

Scopelus pusillus Johnson, 1890, Madeira

Lampanyctus alatus Good and Bean, 1895, Gulf of Mexico. (N. lat. 28°43′, W. long. 87°14′30″, in 525 fathoms.)

Myctoyhum (*Lampanyctus*) *alatus* Brauer, 1906, (South of Canaries, N. lat. 24°43′4″, W. long. 17°1′3″, Sierra Leone, N. lat. 8°58′, W. long. 16°27′9″; N. lat. 5°5′5″, W. long. 13°27′5″; Gulf of Guinea, N. lat. 2°36′5″, E. long. 3°27′5″)

Myctophum (*Lampanyctus*) *alatum* Zugmayer, 1911, (Canaries, N. lat. 28°4′, W. long. 16°49′30″, in 1000 m; South West of Azores, N. lat. 31°42′, W. long. 42°40′, in 2500 m.)

Distribution: Warmer Atlantic and Indian Oceans.

Head 3.2; Depth 5.5; Dorsal fin 11 rays; Pectoral 12, Anal 15, Lateral line scales $34^{4}/_{5}$; Pectoral fin very long, inserted below in middle body depth, reaches middle of anal base. Teeth minute, in narrow bands in jawa. Photophore been shaped. Branchiostegal photophore could not be traced, for that skin were harmed. One photophore at middle of cheek, pectorals 5, the fourth elevated, subpectorals 2, ventrals 4, anals-1st group above anai base 7, 2nd group above caudal peduncle 8; postero-laterals 2; suprapectoral and supraventral close below lateral line. No photophore on shoulder. Dorsal begins somewhat behind ventral, before middle of body. Anal origin nearly midway in body and ends before adipose fin,

Measurements as follow

Total length	38.8 mm
Body length	30.5

Depth	5.5 mm
Head	9.5
Eye diameter	1.7
Jaw length	6.6
Dorsal fin, length of base	6.0
,, , height of front	7.5
Ventral fin, distance from snout	13.4
,, , from root of pectorals	3.5
Anal fin, height	5.7
,, , length of base	7.2
,, , distance from end to base of caudal	6.3
Pectoral fin length	13.6

Neoscopelus macrolepidotus Johnson Jap. name "Sotori-Iwashi".

Neoscopelus macrolepidotus Johnson, 1863, Proc. Zool. Soc. London, XXXVIII p 44, Madeira.—Vaillant, 188, Exped. Sci. "Travailleur" et du "Talisman", Poiss, P. 119 (off Morocco, 1350–1590 m.)

Scopelus macrolepidotus, Günther, 1864, 'Cat, Fish. Brit. Mus.' V, P. 414

Neoscopelus alcocki Jordan & Starks, 1904, Bull. U. S. Fish. Comm. XXII. (Sagami bay in 173–260 Fathoms).

One floating dead specimen, obtained at Myojin bank. Total length, 205 mm. Head 3.17 in length; depth 3.44; D. 10; A. 10 Scales 4–32–4; eye 4.25 in head; snout 3.4; maxillary 2.0. Body oblong, subfusiform rather compressed, covered with large caducous scales, head broad somewhat depressed above, and the cheeks are flat; mouth large, oblique, maxillary extending to below posterior margin of orbit, not delated behind, posterior boader truncated; the under jaw projects slightly beyond the upper; teeth small, in villiform bands; eye moderate; scales nearly all fallen in specimen examined; lateral line well developed; luminous spots large, in about 5 rows on breast, about 11 in a lengthwise series from isthmus to ventrals, then a median and two lateral rows, to opposite front of anal, 10 spots in outer row, an oblong circle of 9 small photophores about the vent; a row of 15 small photophores, continuous with inner lateral row before vent, from opposite vent to base of caudal; there is also an inner series of minute white dots along base of anal rays; a median row of small photophores behind and below caudal peduncle. Dorsal rather large, inserted before ventral, its longest ray about 1.72 in head; longest anal ray 2.9 in head; caudal well forked; pectoral long, about equal length of head; ventral 2.1 in head; gill-rakers long and slender.

Color pale or grayish above, belly black; a dusky shade at base of caudal and pectoral; inside of mouth black.

Dr. Oshima described that, arrangement of the photophore of *Neosbopelus* is variable and N. *alcocki* Jordan & Starks is the synonym of N. *macrolepidotus* Johnson. We also agree with this opinion.

Fam. *Sternoptychidae*

Argyropelecus hemigymus Cocco New Jap. name "Tengan-mune-eso" PL. XXIII. Fig. 2, 3.

Distribution. Mesina; Canaries and off Morocco, in 1123–1200 m; Madeira at N. lat. 28°4′, W. long 16°49′30″ in 1000 m; between Azores and Portugal in N. lat. 37°41′ W. long. 15° to 19°, in 1000–3000 m South of Ascension Island in S. lat. 11°19′, W. long. 18°34′, in 1200 m South-West of Sierra Leone in N. lat. 0°46′ W. long. 18°59′ in 3000 m; N. lat. 5°27′, W. long. 21°41′, in 5000 m; North-West of Cape Verda Is. in N. lat. 17°28′, W. long. 29°42′ in 3000 m North of St. Helena in 2000 m; South-West of St. Helena in 3000 m between San Miguel and Terceira, Azores in 992 m; between Portugal and Azores in 2100 m; off Azores in 2600 m; off Madeira, at surface.

Total length 24 mm; body length 21 mm; head 6.5 mm; depth 10 mm; head 3.2 in body; depth 2.1 in body; dorsal V, 8; anal 6+5, pectoral 7; ventral 5; snout 3.2 in head measured from upper jaw tip; eye 2.2 mm; maxillary 4.2 mm. Body strongly compressed, deepest at dorsal origin. Narrow caudal peduncle, its least depth twice its length. Snout short, less than eye diameter. Eye high, its center a little behind middle in head. Mouth large, maxillary large, hind edge opposite hind pupil edge. Row of small, slender, short teeth in both jaws and along entire edge of maxillary. Nostrils close before eye, posterior larger. Interorbital is a narrow constricted bony ridge. Lower end of mandible ends in strong, sharp-pointed spine. Preopercle with short spine at angle directed back and below, another directed forward. Small luminous organ on inner ceratobranchial arch showing indistinctly as 6 whitish spots; a similar one on front shoulder girdle each side and below 12 pairs along ventral ridge of trunk; ventrals 4 each side of body; anals 6 pairs; caudals 4 pairs; 2 large ones above pectoral axil; small narrow organ closed behind eye, opposite its middle. 1st dorsal with 6 spines graduated up to last, each greatly compressed and hastate in shape. 2nd dorsal just after ninth thorasic photophore, first ray highest, others graduated down. Anal similar, inserted after dorsal base. Pectoral long, reaches nearly opposite depressed ventral trip. Ventral small, inserted below hind dorsal rays, rounded. Its just agree with Fowlers discription (Bull. Ameri. Muse. Nat. Hist. Vol. LXX 1936, Marine Fishes of West Africa. pp. 245)

Fam. *Monacanthidae*

Cantherinus howensis (Ogilby) Total length 137 mm

Jap. name "Hakusei-hagi'

Distribution. Central to Southern Japan, Lord Howe Is. Honolulu, Tahiti

Fam. *Diodontidae*

Diodon holacanthus Linne Total length 79 mm

Jap. name "Harisenbon"

Distribution. Central Japan to South Sea, Indian Sea, Atlantic Sea, Cosmopolitan

We caught the following fishes by vertical long line at Bayonaise bank (about 3 miles east from Myojin bank) in 75–120 m depth.

Fam. *Priacanthidae*

Priacanthus boops (Schneider) Total length 220 m

Jap. name "Chikame-kintoki" Common

Syn. P, *japonicus* Cuvier & Valenciennes

Distribution. Center Japan to China Sea, Hawaii, New South Wales, Ceylon, Borneo, Philippine, Queensland, Madagascar, Arabia.

Fam. *Serranidae*

Sub-Fam. *Epinephelidae*

Epinephelus fasciatus (Forskal) Total 1. 250 mm

Jap. name "Aka-hata" Common

Distribution. Central Japan to China, Philippines, Arabia, Red Sea.

Fam. *Lutjanidae*

Paracaesio xanthurus (Bleeker) Total 1. 377 mm

Jap. name "Ume-iro" Common

Distribution. Hachijo Is., Ogasawara Is., off Kochi, Madagascar, Pristipomoides amoenus (*Snyder*) Total 1. 380 m

Jap. name "Hana-fu-edai" not common

Distribution. Hachijo Is., Kochi, Riukiu Is.,

Etelis carbunculus *Cuvier & Valenciennes* Total 1. 420 mm

Jap. name "Hama-dai"

Distribution. Central Japan to South Sea, Hawaii, Madeira, East and West Indian Is.

Fam. *Balistidae*

Balistes chrysopterus Bloch & Schneider Total 178 mm

Jap. name "Tsumajiro-mongara"

Distribution. Kochi, Riukiu Is. China Sea, Philippines, East Indian Is. Australia, New Guinea, Polynesia, Micronesia, Melanesia, Queensland, India, Zanzibar, Red Sea.

N. B. There were many specimens of *Paracaesio caeruleus* (Katayama) "Ao-dai", and *Pristipomoides sieboldi* (Bleeker) "Hime-dai" in Hachijo market, which were caught by fisherman of Hachijo Is., with deep sea vertical long line.

7. Summary

With the purpose to make a survey on conditions of the eruption and the effect of it on fisheries, the training ship Shinyo Maru of the Tokyo University of Fisheries made a four day investigation during September 21–24, 1952. The members comprising the party were faculty members of the Tokyo University of Fisheries, Earthquake. Research Institute of the Tokyo University, Tokyo University of Education, Tokyo Science Museum, and Bureau of Fisheries. Several reporters of the Asahi Press also joined the party.

Investigations commenced from the 23 and continued to the following day, during which time there were three explosions of Myojin-sho, but fortunately the ship and its crew returned safely. Myojin-sho forms part of the outer ring of submarine volcano on which Bayonnaise Island is situated, and lies on the northern part of the submerged caldera of complicated configuration. Myojin-sho itself is the result of a part of a submarine eruption. The Myojin-sho which was reported to have appeared on the 13th and 18th of September 1952, was found to be represented by only two small rocky projects appearing only about one meter above sea-level during low tide at the time the Shinyo Maru visited the site on September 23, 1952. This is due probably to the explosion which occurred on the 23rd. The pumice ejected from the explosion was determined as quartz andesite, thus it is to be noticed that the ejects from the submarine volcano which is situated on the Fuji volcano zone consisted of material of different nature. Although the volcanic vent could not be observed owing to the danger it is believed to be about 1 km in diameter. During eruption a radius of about 2 knots was the critically dangerous area. At the begining of eruption, the phenomenon of sea-water raising as a dome was of particular interest. The yellow vapour steam flowing from the vent had an angle of 30° at its front and flowed in South-West direction for several ten knots, The yellow stream near the center of eruption was evidently disasterous to bottom fish and deep sea fish as they could be seen floating dead on the surface together with dead plankton, thus the water was poisonous. However, from oceanographical observations, the thickness of the yellow stream was found to be only about 25 meters, thus the strength of the poisonous nature was not strong. The effect of the eruption to fisheries seems to be only within a small radius from the volcano vent. From the results of fishing by an electric sounding machine wire, it is found that the effect of the eruption on the fishing grounds in the vicinity of Bayonnaise Island lying to the west of Myojin-sho can be considered as null. Further the entire sea area of Myojin-sho can also be considered as a good fishing grounds.

Finally particular thanks are due to the members who participated in the present survey.

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PART I

PLATES I–XXIV

PLATE I.

Cumulo-ninbus on Myojin-sho by the explosion. (left) 15 pm September 22, 1952.
From Hachijo Island.
(photo by Y. Kanno, Kagaku Asahi)

Fig. 1

PLATE II.

Voyage for Myojin-sho.

Fig. 1. Training ship Shinyo-maru of the Tokyo University of Fisheries. 229 tons.

Fig. 2. A watch man on mast.

Fig. 3. Surveyors working.

Fig. 1

Fig. 2.

Fig. 3

PLATE III.

Voyage for Myojin-sho.

Fig. 1. Shinyo-maru set sail for Myojin-sho from Horawazawa, Hachijo Island.

Fig. 2. A distant view of Hachijo Fuji, Hachijo Island.

Fig. 3. Surveyors on deck.

Fig. 4. ditto

Fig. 1

Fig. 2

Fig. 3

Fig. 4

PL. III.

PLATE IV.

Photograph of Beyonnase rocks.
Fig. 1. Distant view of Bayonnaise rocks.
Fig. 2. Distant view of Bayonnaise rocks. (From 0.8 nautical miles)
Fig. 3. Enlarged photograph of figure 2.

Fig. 1

Fig. 2

Fig. 3

PL. IV.

PLATE V.

Explosion of Myojin-sho at 8h 34 m a.m. September 23, 1952.
Observation: 188° in azimuth, 5 nautical miles from the explosion point.
Observation point, Lat. 31 51, 7 N; Long, 139 58, 7 E.
(Figures 1-8 show the sequence of explosion changes.)

Fig. 1. After 40 seconds. 500 m high, 1000 m wide.
Fig. 2. After 1 minute and 30 second.
Fig. 3. Ditto 700 m high, 1900 m wide.
Fig. 4. After 2 minute and 30 second. 1800 m high, 1500 m wide.
Fig. 6. After 6 minutes. 3000 m high.
Fig. 7. Ditto
Fig. 8. Distant view of explosion and the author.

Fig. 1

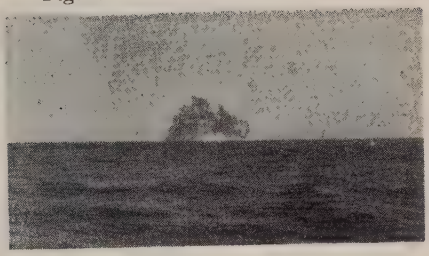


Fig. 2

Fig. 3

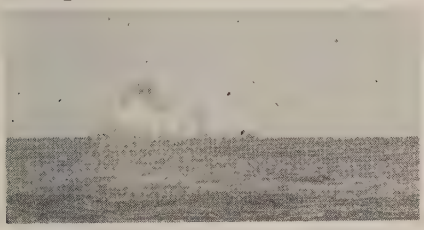


Fig. 4

Fig. 5

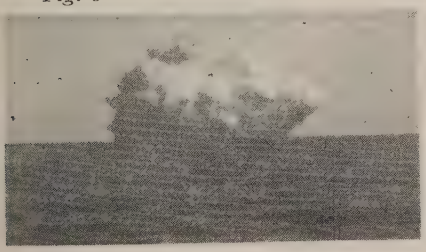


Fig. 6

Fig. 7

Scale

0 1000m 2000m

Fig. 8

PLATE VI.

Explosion of Myojin-sho at 8h 34 m a.m. September 23, 1952.
Observation point are same to Plate V.
Fig. 1-2. After 7 minutes.
Fig. 3. After 8 minutes. The zenith of smokes attained 6700 m. high.
Fig. 4. After 8 minutes and 50 seconds.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

PLATE VII.

Explosion of Myojin-sho at 8h 34m a.m. September 23, 1952.
Observation point are same to Plate V.
Fig. 1. After 7 minutes.
Fig. 2. Falling of pumice and ash. After 9 minute.
Fig. 3. After 30 minutes, there are no trace of explosion.

Fig. 1

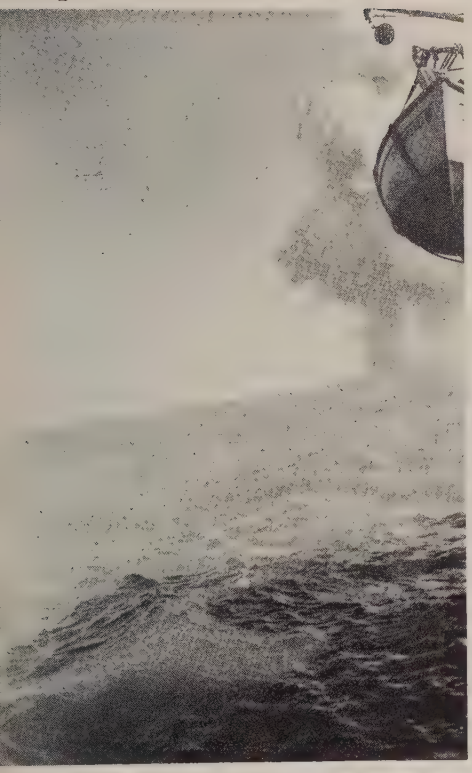


Fig. 2

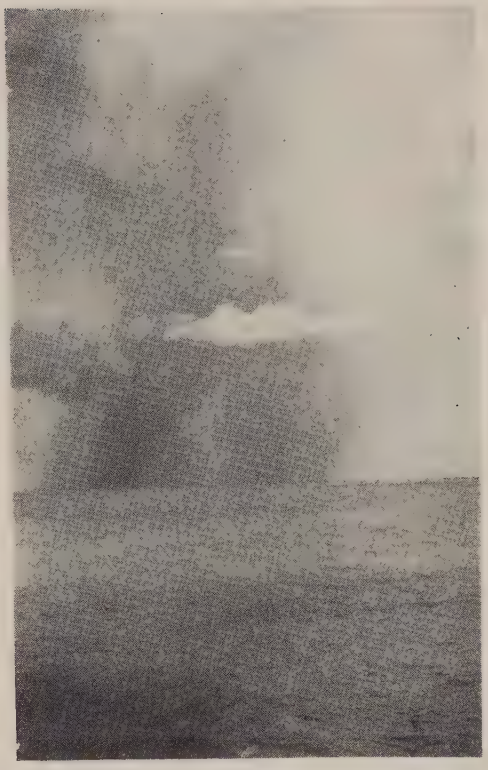


Fig. 3

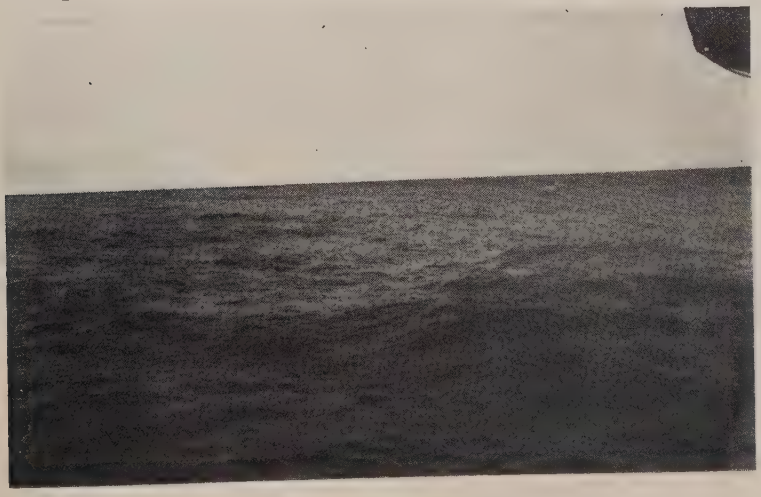


PLATE VIII.

View of the explosion at 13h 12 m, September 23, 1952; 252 in azimuth, 2000 m distant from the crater.

Observation point:-Latitude 31°56.5′N.
Longitude 139°58.4′E.

Fig. 1. After 10 seconds, 400 m high, 600 m wide.
(photo by Y. Kanno, Kagaku Asahi)

Fig. 1

PLATE IX

View of the explosion at 12h 12m. September 23, 1952.
Observation point:—Same to Plate VIII.
After 50 seconds. 600 m high, 800 m wide.

(photo by Y. Kanno, Kagaku Asahi)

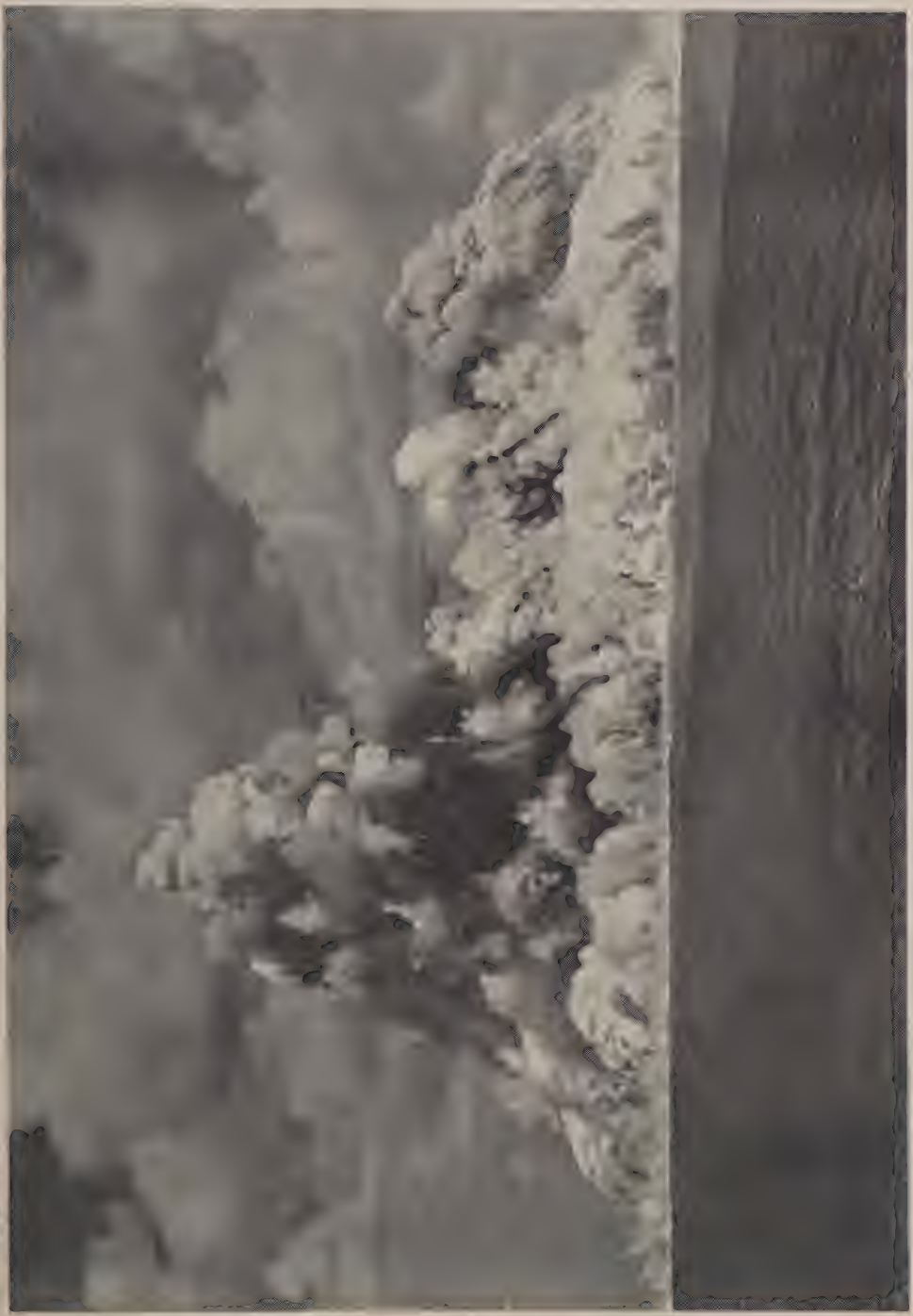


Fig. 1

PLATE X.

View of the explosion at 12h 12 m, September, 23, 1952.
Observation point:—Same to Plate VIII.
Fig. 1. After about 50 seconds. 600 m high, 800 m wide.
Fig. 2. After about 1 minute and 30 seconds.
Fig. 3. After 3 minutes and 30 seconds.
Fig. 4. Same to Fig. 3.

Fig. 1

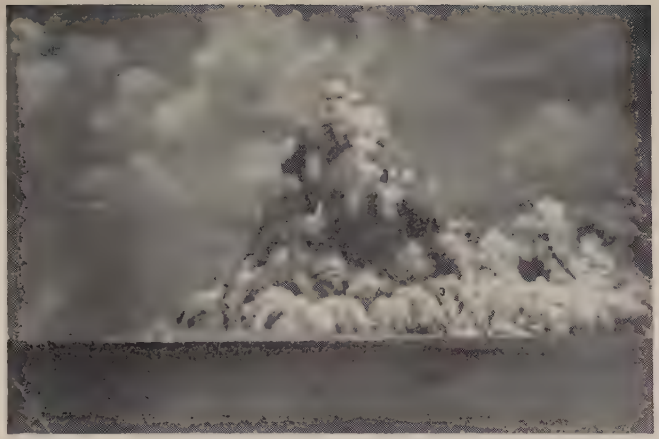


Fig. 2

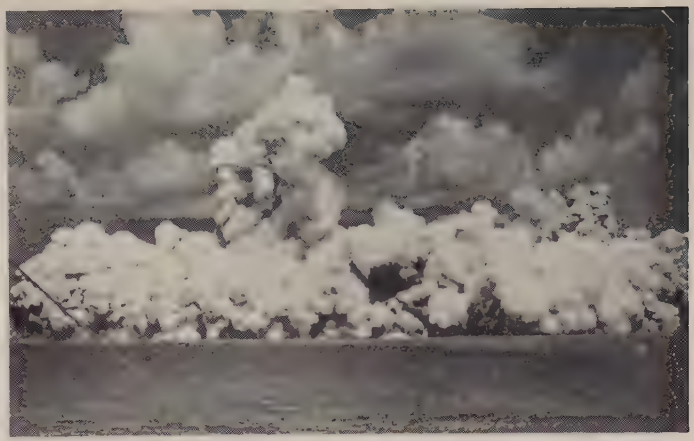


Fig. 3

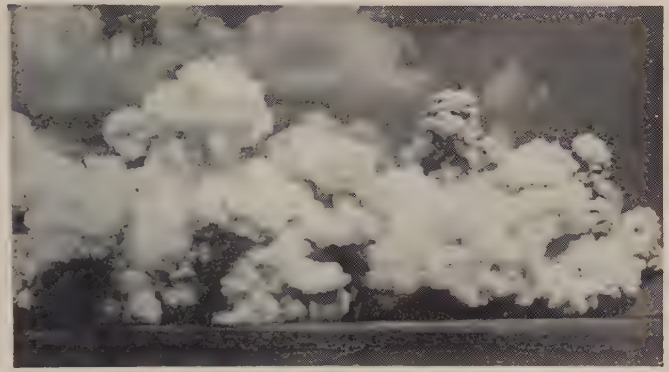
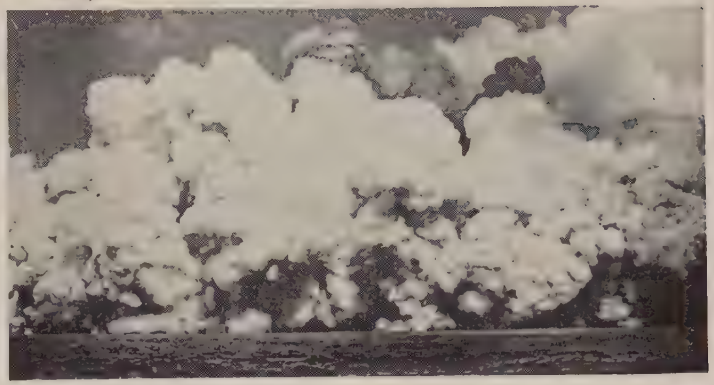


Fig. 4



PL. X.

PLATE XI.

View of the explosion at 12h 12 m, September 23, 1952.
Observation point:—Same to Plate VIII.
Fig. 1. After 3 minutes.
Fig. 2. After 3 minutes 30 seconds.
Fig. 3. Same to Fig. 2.

Fig. 1

Fig. 2

Fig. 3

Scale 0 200m 400m 600m

PLATE XII.

View of the explosion at 12h 12 m, September 23, 1952.
Observation point:—Same to Plate VIII.
Fig. 1. After 4 minutes.
Fig. 2. After 5 minutes. See the yellowish green discolored water zone on the right side.
Fig. 3. The beginning of the explosion, after 5 second. (photo by R. Morimoto. Earthq. Res. Inst.)

Fig. 1

Fig. 2

Fig. 3

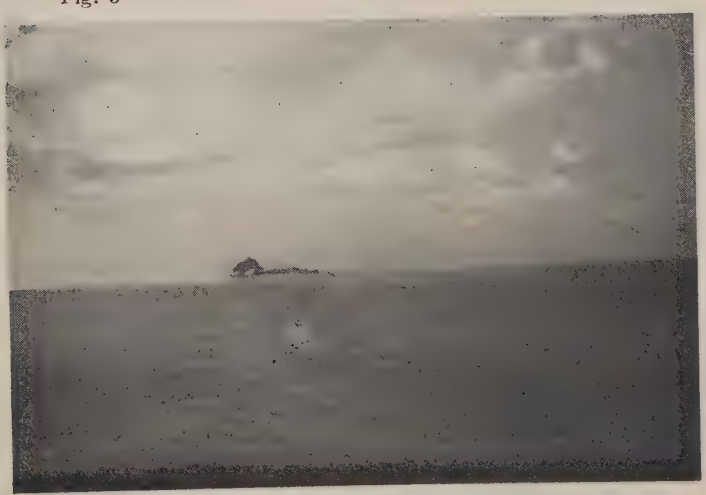


PLATE XIII.

View of the crater just after the explosion at 12h 12 m, September 23, 1952
Fig. 1-5.—Pumice floating with vapour near the crater.

Fig. 1

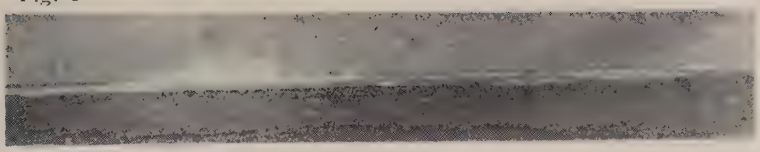


Fig. 2

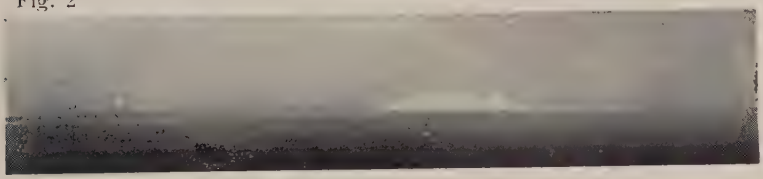


Fig. 3

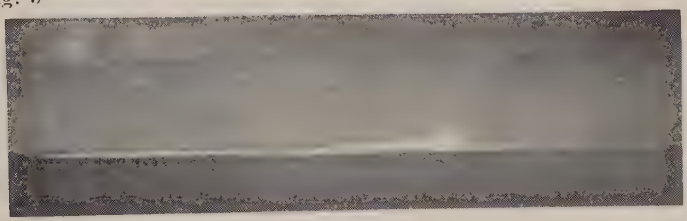


Fig. 4

Fig. 5

PLATE XIV.

View of the surface of the sea near the crater, after the explosion at 12h 12 m, September 23, 1952.

Fig. 1. Floating pumice.

Fig. 2. Floating pumice.

Fig. 3. Small grained pumice which were fall down on the surface of the sea from sky.

Fig. 1

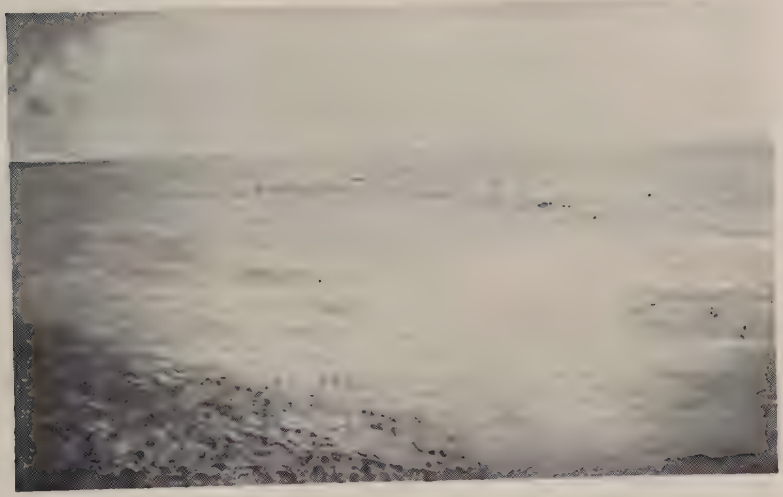


Fig. 2

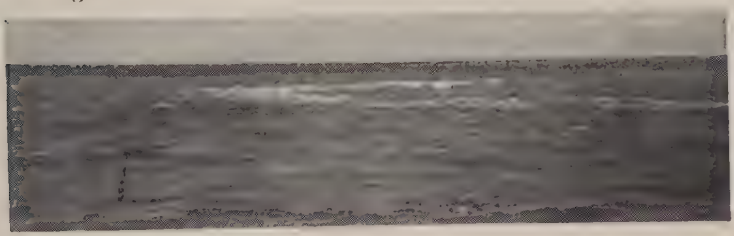


Fig. 3

PLATE XV.

View of the surface of the sea after the explosion at 12h 12 m, September 23, 1952.

Fig. 1-2.—Right side are discolored yollowish green zone and left side are the blue water zone.

Fig. 3. Floating pumice.

Fig. 1

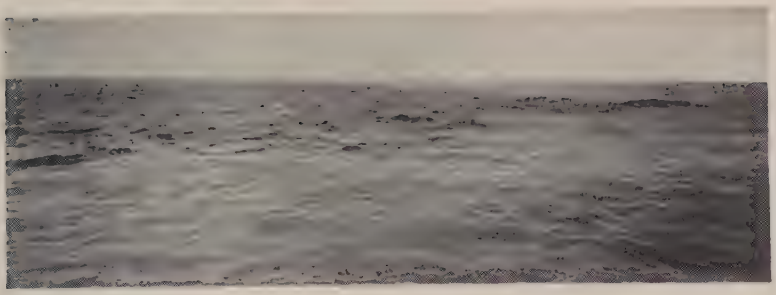


Fig. 2

Fig. 3

PLATE XVI.

View of the explosion at 13h 40 m September 23, 1952. Snapshoted 1600 m. distant from the crater. Latitude 39°56.2 N.; Longitude 139°58.8 E.

Fig. 1. Beginning of the explosion. The surface of the sea rise abruptly and water dome reach about 5 m. high. Then the center of the water dome stired as like as boiling water and reaches about 30 m. high. Black lump of cloud sput from the fissure of the water dome and the white vapour come up its margin.

After 5 seconds. Hight of Water dome about 10 m.

(photo by Y. Kanno, Kakaku Asahi)

Fig. 1

PLATE XVII.

View of the explosion at 13 h 40 m, September 23, 1952.
Observed station:—Same to Plate XVI.
Fig. 1. After 8 seconds. The water dome still remain. 250 m high. 600 m wide.
Fig. 2. After 10 m. 400 m. high, 1100 m wide.
Fig. 3. After 15 seconds. 500 m high, 1400 m. wide.
Fig. 4. After 15 seconds. 800 m high, 2000 m wides.

Fig. 1

Fig. 2

Fig. 3

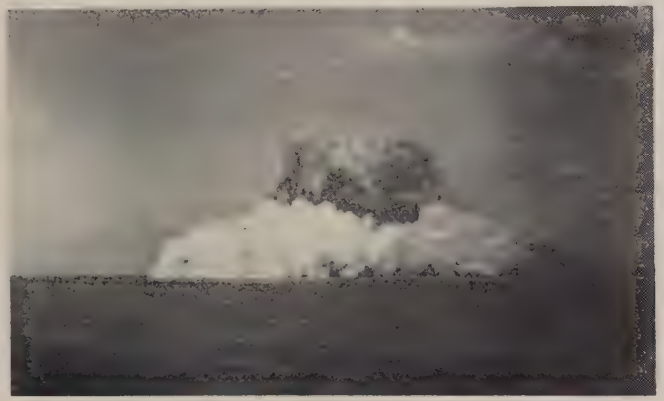


Fig. 4

PL. XVII.

PLATE XVIII.

View of the explosion at 13 h 40 m, September 23, 1952.
Observed station:—Near to the station Plate XVI.
Fig. 1. After 30 second, 1100 m. high. Electric light on the left. 1100 m high.
Fig. 2-4. After about 1 minute, Volcanic dust covered the ship and danger impends.

Fig. 1

Fig. 2

Fig. 3

PLATE XIX.

View of the explosion at 13 h 40 m, September 23, 1952.

Fig. 1-2:—The danger was imminented, the ship steers clear of crater by full speed.

Fig. 3. Floating pumice with vapour.

Fig. 4. New rock near the crater after explosion at 13 h 40 m. View, 227 in azimuth, 1600 m. distant from the crater.

Fig. 1

Fig. 3

PLATE XX.

View of the explosion at 13 h 40 m, September 23, 1952.
After 30 minutes. Dirft pumices around the crater.
Colum of the vapour in the center.
(photo by Y. Kanno, Kagaku Asahi)

PLATE XXI.

View of the explosion just after the explosion at 13 h 40 m, September 23, 1952. Drift pumices.

(photo by Y. Kanno, Kagaku Asahi)

Fig. 1

PLATE XXII.

View of the crater just after the explosion at 13 h 40 m, September 23, 1952.

Few rock reef, about 1 m high at low tide time was seen in the center of the photograph, burning of droped pumices arranged as a large circle around the crater. At the upper streams of the sea water, on the north half of the crater, there spread clear blue water and flying fishes swim across the crater.

(photo by Y. Kanno, Kagaku Asahi)

Fig. 1

PLATE XXIII.

The Lantern fishes collected by Shinyo-maru at Myojin-sho.
Fig. 1. *Macrostoma pusillum* (Johnson)
Fig. 2. *Argyropeleus hemigymus* Cocco (Tengan-mune-eso)
Fig. 3. Upper view of Fig. 1.

Fig. 1

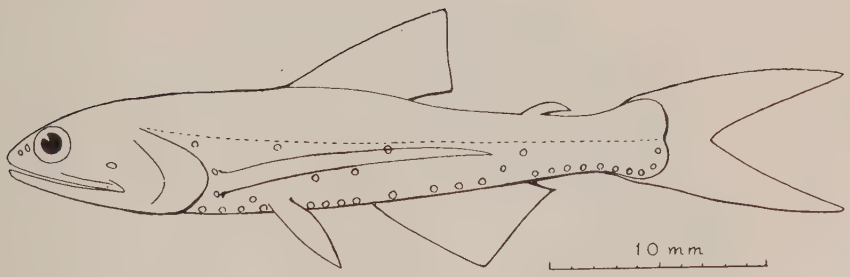


Fig. 2

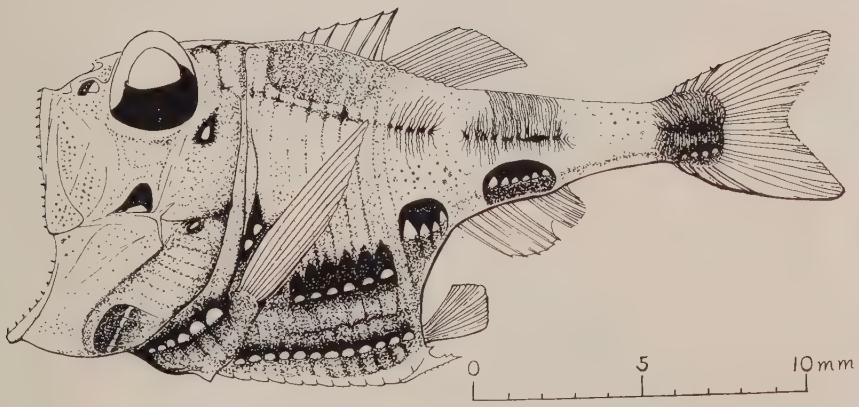


Fig. 3

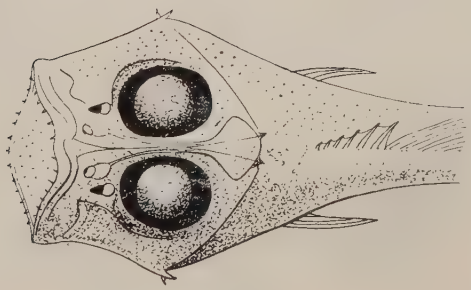


PLATE XXIV.

Photo micrograph of the pumice.
Fig. 1. Open nicol ×17.
Fig. 2. Cross nicol ×17.

(photo by R. Morimoto, Earthq. Res. Inst.)

Fig. 1

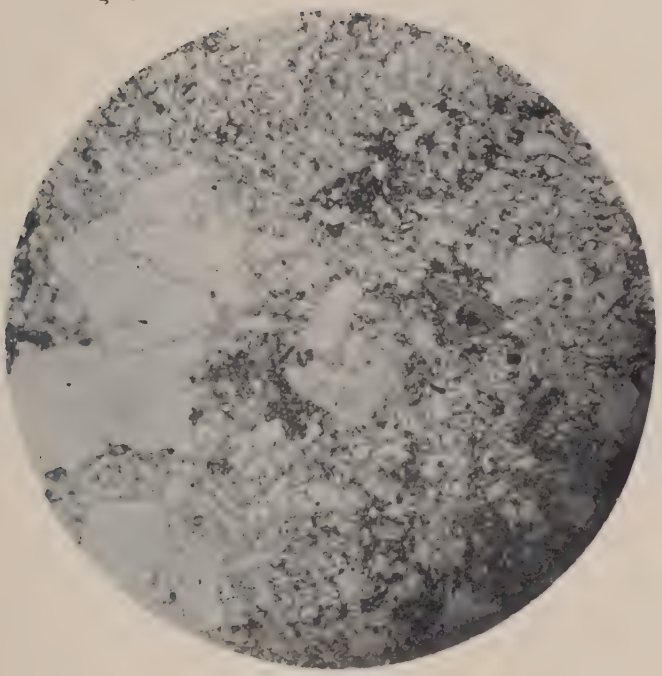
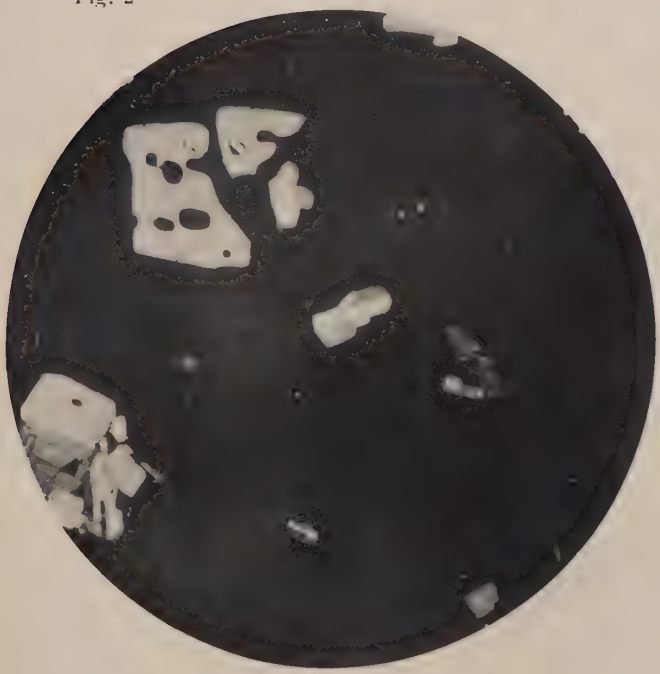


Fig. 2



Part II. THE SECOND SURVEY OF MYOJIN-SHO

Hiroshi Niino

(With Text-figures 1~4; Plates I-V, and 1 Table)

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1. Introduction

On the occasion of the first survey of Myojin-sho on September 23, 1952, Myojin-sho was in its maximum period of volcanic activity. When the Eleventh Myojin Maru first discovered Myojin-sho and when the coastal patrol ship Shikine of the Marine Safety Bureau undertook its first investigation, the volcanic Island stood above sea-level, but on the occasion of the first survey by the Tokyo University of Fisheries, nothing but two isolated rock masses could be found and only during low tide. These rock masses projected about one meter above sea-level during low tide. Although frequent reports on the explosions of Myojin-sho have been received by the Fifth Kaiyo Maru and other vessels, there seems to be no report of the appearance of a Volcanic Island. The reports all concern the yellow stream flowing from the site of eruption in a width of several knots and in a length of 20–30 knots. Reports on the volcanic activity have been received thereafter and according to the report of a vessel cruising in the vicinity in December 1952, Myojin-sho has grown into a large volcanic Island and that volcanoe smoke still continues to pour from the vent and that the yellow colored stream still flows therefrom. With the coming of the spring season when *Cypselurus agoo* (Temminck and Schlegel) and *Katsuwonus vagans* (Lesson) migrate via the Izu Islands and the vicinity of Myojin-sho where

is situated the important fishing grounds for the mentioned as well as other fishes, it becomes necessary to determine the effect of the yellow stream upon them. For this purpose the Tokyo University of Fisheries's training ship Umitaka Maru made the second survey of Myojin-sho.

Observations on February 1, 1953 revealed that Myojin-sho had grown into a large volcanic Island and that the yellow stream flow was confined to a small area circling the Island. It was further found that the effect of the yellow stream on fisheries was without consideration.

2. Arrangement and Course on the Occasion of the Second Survey of Myojin-sho

1) Arrangement of the survey.

Ship. Umitaka Maru (755 tons). Equipped with Radar, Loran Spery Compass, Echo sounding machine and apparatus necessary for oceanographical observations.

Crew. Captain, Katsumi Harada; Chief Officer, Keijiro Ozawa, Second Officer, Keiji Yamamoto; Third Officer, Saburo Yanagawa; Fourth Officer, Tamio Saito; Chief Engineer, Ki-ichi Fujimoto; besides the general crew.

Surveying Party. Geodesy.: Professor Takeharu Kumagori, Assistant Professor Yasuyuki Sasaki, Technical expert, Hideo Otani. Oceanography and Volcanism.: Professor Hiroshi Niino, Assistants, Yoshio Miyazaki and Makoto Ishino, Fisheries.: Assistant Professor Chiaki Arihara, Lecturer Kenji Kanda. Biology.: Assistant Jin Hattori.

Reporter.: Messrs. Jitsuo Kusaka and Jungo Tanaka of the Asahi Press.

2) Course of the survey ship. The training ship Umitaka Maru of the Tokyo University of Fisheries departed from Tateyama-machi in Chiba Prefecture, the site of the university experimental grounds, at 11:00 pm on January 29, 1953. At 12:00 pm the ship entered Horazawa Harbour on Hachijo-jima on January 31, 1953. Data concerning the activity of Myojin-sho was gathered at the Hachijo-jima observatory and at the Hachijo-jima Department of Fisheries. At 11:00 pm ou the 31st the ship left harvour and headed for Myojin-sho. At 4:45 am on February 1, 1953, by the aid of Radar, Myojin-sho was recorded from 13.5 nautical miles from the south of Aogashima. The Radar used was that which is attached to ships of the twenty-thousand ton class. At 6:00 am the ship reached the western side of Bayonnaise Island and the position of Myojin-sho was determined therefrom. At 6:45 am came within 3 knots of Myojin-sho, then circling the site once from the right, photography and geodesy observations were undertaken.

At 10:15 am the ship came within 2 knots of the island and circled Myojin-sho once more, during which time one station was plotted for deep layer oceanographi

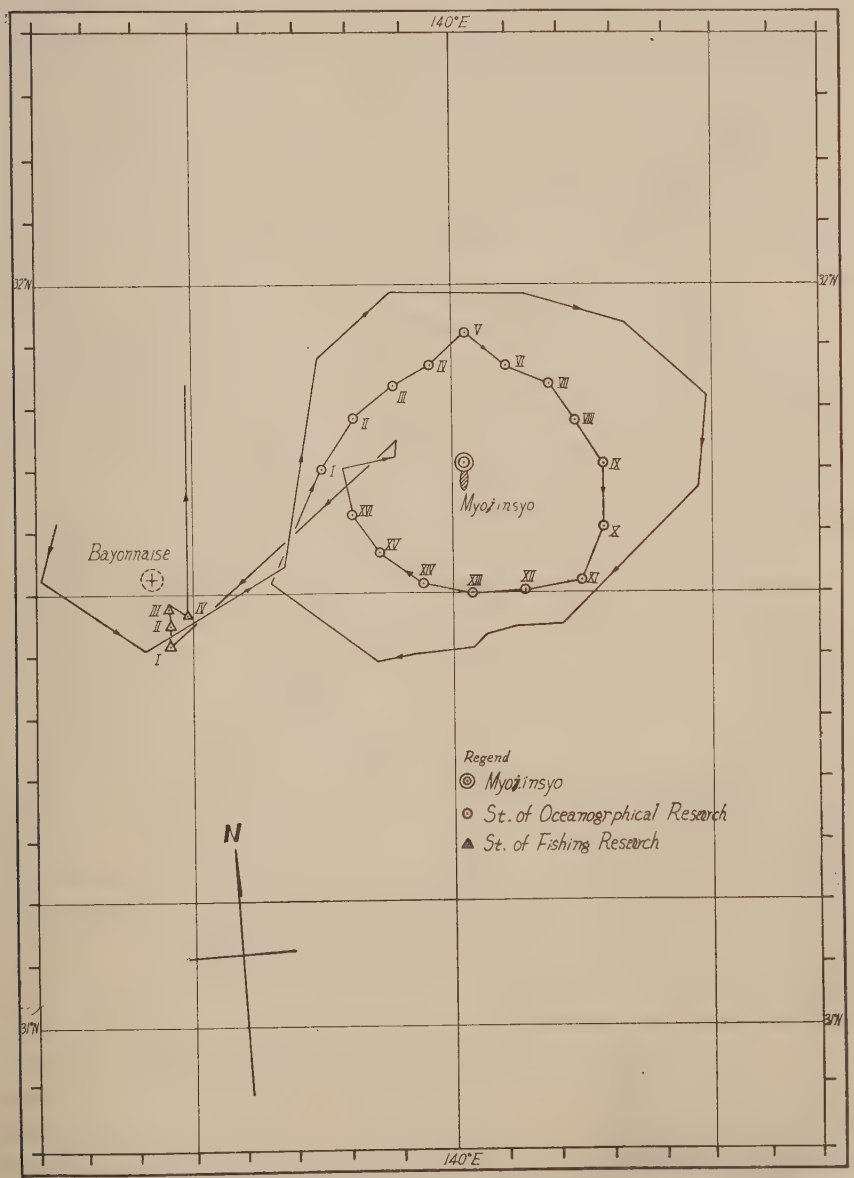

Figure 1. Course of the second survey of Myojin-sho.
(February 1, 1953, Training ship Umitaka Maru)

cal observations of the sea surface and 16 for surface layer survey. Finally the ship was brought within 1.8 knots of Myojin-sho and flowers, food and drinking water were thrown into the sea to pray for the persons who met their unfortunate disaster there. Arriving immediately or 1 nautical mile south of Bayonnaise Island at 4:00 pm, two oceanographical observations and three fisheries investigations were done, after which the ship headed towards its base. At 4:00 pm. on February 2, 1953 the ship arrived safely in Ito harbour on Izu Peninsula, thus completing the second Myojin-sho survey. During the second survey, the weather was fine, the north-westerly winds velocity was 10 m/s, thus the sea was rather rough and observations were difficult, however, the party and crew returned safely to their base.

3. Reports Concerning Myojin-sho since the First Survey

At 1:30 pm on September 25, 1952, the Third Nisshin Maru of the Fisheries Bureau reported a great explosion of Myojin-sho. On the 26th of the same month, the coast patrol ship Muroto of the Marine Safety Bureau while searching for the Fifth Kaiyo Maru, observed the explosion of Myojin-sho. On October 3, 1952, the same ship again saw the explosion of Myojin-sho. At 12:45 pm and 1:50 pm on September 24, 1952, vibrations were recorded at Hachijo-jima and on the 25th at 5:00 am the entire Island was covered with ash, On December 9, 1952, the Tonan Maru of the Fisheries Experimental Station of Tokyo-fu while cruising in the vicinity, recorded a volcanic Island 50 meters high and separated by a distance of about 200 meters, a small rock was seen projecting above the sea surface. On the 16th of December 1952, the Kyoei Maru of the Chiba Prefecture Fisheries Experimental Station while cruising in the vicinity of Myojin-sho, reported the occurrence of a volcanic Island about 50 meters high, which was vomitting smoke.

From the aforementioned data it is clear the Myojin-sho first appeared as a volcanic Island, then became submarged, and again grew into a volcanic Island, and during the present survey, it was noticed that Myojin-sho as a volcanic Island had disappeared from the sea surface.

4. Progress of the Second Survey of Myojin-sho

1) Course of the ship. On February 1, 1953, owing to strong north-westerly winds blowing at a velocity of 16 m/s, depth recording was rendered difficult and for the sake of safety the ship was kept 2 knots from Myojin-sho owing to the falling of volcanic bombs. Within this radius the ship continued observations.

2) Geodesy

a) Position. For determination of position the oceanographical chart No. 81, published by the Hydrographic Department with Bayonnaise Island situated in lat. 31°55.3′ N., long. 139°54.5′ E., was used. According to the Mercantile Marine Atlas (Philip Co., Ltd.) of 1952, Bayonnaise Island is stated bo be situated in lat. 31°57′ N., long, 139°55′ E., but this reading was not used during the present survey. The position of Myojin-sho was determined by use of Sperry 12 inch Rada with Bayonnaise Island as a standard, Also for triangular survey the Aogashima, Bayonnaise Island and Smith Island was used besides the astronomical method. Twenty observations for position were made and repeated. The position of the central part of the new voclanic Island of Myojin-sho was thus determined as lat. 31°57.1′ N., long. 140°00.3′ E.

b) Geomorphology. By cruising twice around the new volcanic Island at distances of three and two nautical miles respectively, the width of the Island was determined by triangulation, as follows:

Triangulation	Width at sea surface	Date and time of observation
14°	205. m	February 1, 1953 8:00
44	220.	8:13
84	200.	8:36
160	156.	9:03
179	194.	9:22
220	220.	9:50
268	194.6	7:13
304	151.	7:31

Owing to the prevailing winds, the curse of the ship was rendered difficult, thus error to some extent cannot be overlooked. The new volcanic Island had its northern part with several columnar peaks, its southern part was a rounded mountain and in between was a wedge-shaped bay, all continuous to build the new Island. On the western and eastern sides the wedge shaped bay was provided with rounded summits to a small summit like projection. The height of the columnar peaks in the northern part of the Island were measured as 93.9 meters above sea-level while the rounded summit at the southern part was 54.8 meters high (correction to tide, respectively).

c) Moment of magnetism, Owing to that observations were made during daytime direct comparison would not be made with the North Star, therefore the directions by Sperry Gyrocompas (M.K. 14) and the Repeater compas were compared with the directions of the Magnetic compass (J.I.S., Type S. 165;1560

C.G.S. magnetic effect) and then the results were calculated. The following results were obtained:

Bearing from Myojin-sho	Distance	Ship's head	Deviation
270°	2′.6	N	+2°.0
100°	2′.6	S	−2°.3
20°	2′.8	E	−1°.5
165°	3′.0	W	−1°.9

Ten observations were made for each respective direction of the ship's head and the averages were plotted, however, the original error and deviation error were already substituted.

For the sake of brevity examination of the deviation of the magnetic compass and the original error of the gyro-compass were undertaken in Sagami Bay. The variation used at the time of this bearing correction was calculated from the magnetic chart and was thus determined as 5° W. The results thus obtained are as follows.

An iron clad vessel, 775 tons and equipped with measurement instruments and gyrocompass, Sperry M.K. 14. Original error −0.5°, and the ship was stable at the time of measurement. For measurement a magnetic compass manufactured by the Tokyo Keiki Company in 1949 and called Type S 165 was used. The magnetic effect was 1560 C.G.S., and the compass compensator was good. Other readings are,

Ship's head	Deviation
N	−0.8°
E	+0.5°
S	+0.7°
W	−0.6°

The measurement deviations taken at Myojin-sho were within the range of 20° there it is believed that the reading error is about ±0.3°. However, since it is evident that the magnetic needle was pulled towards Myojin-sho, it is also clear the magnetic deviation existed.

3) Condition of the Myojin-sho Volcano.

a) Bottom configuration. Myojin-sho is believed to be part of the outer ring on which Bayonnaise Island is situated, and also to be a submarine velcano. The ship Umitaka Maru commencing at lat. 31°46′ N., long. 140°07′ E., echo soundings were recorded between Bayonnaise Island and Myojin-sho. From the results it is evident that a 1600 meter deep platform sharply rises with steep walls in the point of lat. 31°50′ N., long. 140°01.5′ E., to a depth of 318 meters, and therefrom to the northern part of depth varies between 300 to 500 meters,

showing a very irregular bottom which seems to closely resemble the profile of a double volcano.

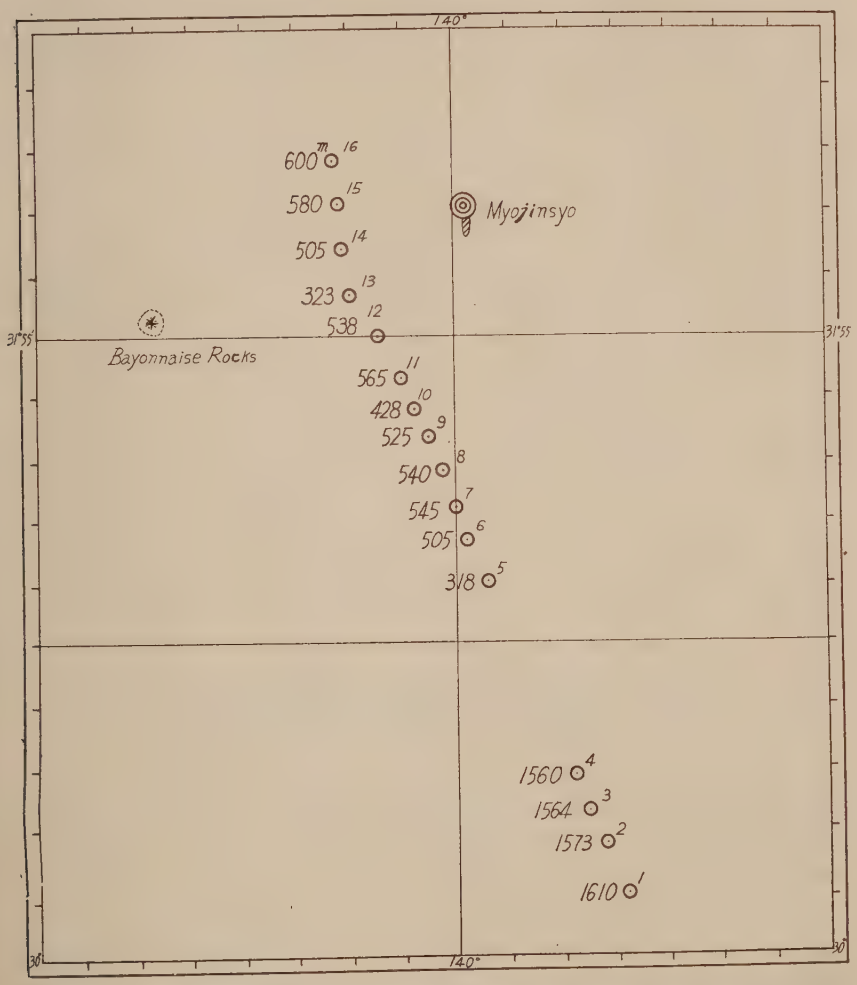

Fig. 2. The course of Umitaka Maru through the midway between Bayonnaise rocks and Myojin-sho. The position and the depth are ascertained at each position.

b) Observations on the geomorphology and geology of Myojin-sho Nii-jima (New Island). Nii-jima of Myojin-sho comprise two remarkably different submarine mountains whose summits appear above sea-level, but whose submerged parts are continuous. The northern part with walls more than 70° steep, appear as nearly vertical and raise 93.8 meiers above sea-level. The rock com-

prising it is dark colored, appearing as a smoke chimney with reddish-brown color coating parts of its surface and from that part vapour is emmitted. The vapour or steam pouring from its upper part reaches a height of about 30 meters or more. On the southern part there is also a steep cliff but on the top there is about a 50 meter broad flat surface. On the south of the black colored block

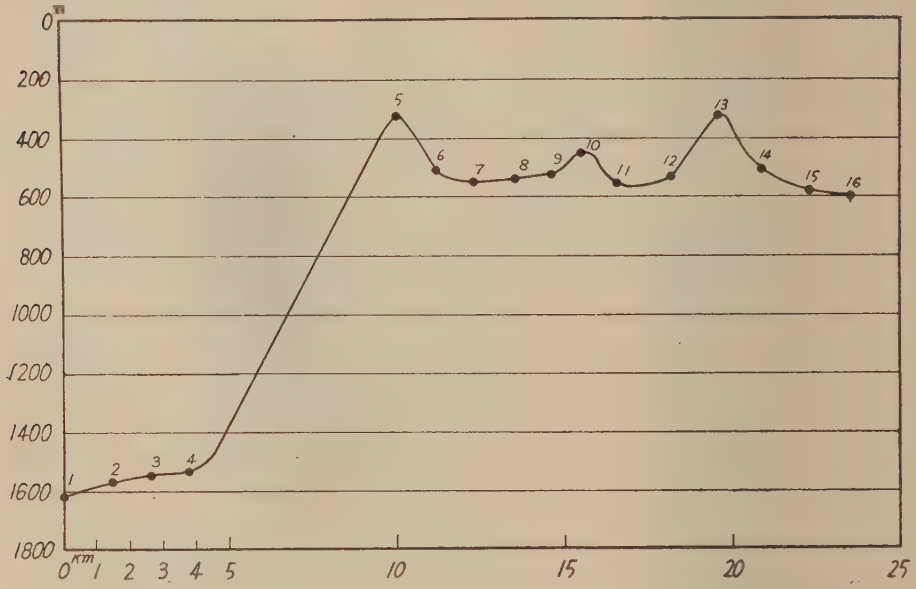

Fig. 3. Submarine configulation obtained by echo sounding along the course of Umitaka Maru which cross longitudinally Bayonnase submarine volcano.

with a small intervening space there is a rounded summit with a 54.8 meter flat surface on its top and the sides are provided with walls as steep as about 30° which descend to the sea surface. There is a very narrow sand beach on its southern foot. The rocks of the rounded summit appears grayish white thus it seems to be different from the columnar rocks of the northern side. Between the northern and southern projections aforementioned there is a small bay-like or indentation from where steam is pouring forth violently. From the 20–30 meter wide indentation on the western side of the rocks yellowish brown steam is being vomitted, about 1,000 meters in south-east direction this steam as a stream can still be observed, but due to that investigations were made from a distance of about 2 knots from the Island, sea-water temperature and composition seemed to show no change.

4) Ocean conditions. Owing to the prevailing north-west winds blowing at a velocity of 16 m/s, cruising was made rather difficult, therefore only surface

Table 1. The result of the oceanographic observation on the surface water around Myojin-sho, February 1, 1953.

Time	Station	N. Latitude	E. Longitude	Surface Temperature	Color	PH	clo/oo	O_2cc/L
10h 15m	No. 1	31°.57′.5	139°57′.5	18.9°C	2	8.1	19.25	5.11
25	2	57.9	58.0	18.9	2	8.2	19.25	5.10
35	4	58.7	59.6	18.9	2	8.2	19.26	——
40	5	59.2	140.00.3	18.8	2	8.3	19.25	5.06
45	6	58.7	01.0	18.9	2	8.2	19.27	5.07
50	7	58.4	01.8	18.9	2	8.2	19.25	5.04
55	8	57.8	02.3	18.8	2	8.2	19.24	5.03
11 00	9	57.1	02.9	18.8	2	8.2	19.25	5.04
07	10	56.0	02.9	18.8	2	8.2	19.25	5.09
15	11	55.2	02.4	18.8	2	8.2	19.25	5.07
25	12	55.1	01.3	18.8	2	8.2	19.26	5.05
37	13	55.1	00.3	18.8	2	8.2	19.26	4.99
45	14	55.1	139 59.4	18.8	2	8.2	19.27	5.15
55	15	55.7	58.6	18.8	2	8.2	19.27	5.15
12 00	16	56.2	58.1	18.8	2	8.2	19.27	5.10
16 47	17	54.8	54.6	——	—	—	19.24	——
57	18	54.1	59.4	——	—	—	19.27	——

observations were made. About 2 knots from Myojin-sho or between lat. 31° 57.0′ N., long. 139°57.5 E., and lat. 31°56.2′ N., long. 139°58.1′ E., a total of 16 stations for observations were plotted. Within this area the sea water temperature was 13°C—19°C., atmospheric pressure 1015.5—1016.5 mmb., wind velocity 11—16 m/s, wind direction north-west, wave and the Grade 5. The time of observations was between 10:15 am to 12:00 pm. Besides the aforementioned, observations for fisheries were undertaken at two stations in the vicinity of Bayonnaise Island with the results that the water color was 2 by Forel's scale, water temperature 18.8—18.9°C, pH 8.2—8.3, Cl. 19.23—19.27, 0_2cc/L 5.03—4.99, thus showing not much difference.

5) Fisheries experiments. The results obtained in the vicinity of Bayonnaise Island were as follows:

North latitude	East longitude	Water Depth	Fishes caught
St. 1. 31°54.2′	139°54.6′	250 meters	None
St. 2. 31°54.5′	139°54.6′	140 meters	3 Umeiro
St. 3. 31°54.8′	139°54.6′	100 meters	None
St. 4. 31°54.7′	139°55.0′	150 meters	None

Although the fisheries experiment was good, work was stopped owing to the unfavorable weather. However, it is believed that the vicinity of Bayonnaise Island is a good fishing grounds.

5. Summary

From the results of the second survey of Myojin-sho, it was found that the new Island (Nii-jima) had grown into a height of 93.8 meters and a width of more than 200 meters. Vapour steam is still being poured out violently. The central part of the Island was calculated as being at lat. 31°57.1′ N-, long. 140° 00.3′ E., and that the position determined by the first survey of Myojin-sho by the Shinyo Maru deviated considerably from that of the second survey. This deviation may be due calculation erro or to that the position of eruption had changed, however, the problem must be left for another opportunity. Within a distance of 1000 meters south of the newly formed Island, the presence of shoals could be recognized, thus indicating the existence of Myojin-sho within that area. The yellow steam vapour vomitted from the volcanic Island was confined to a small area in the surrounding sea and in the sea area 2 knots from the Island no effect of the yellow stream could be observed.

If the present size of Myojin-sho will continue to exist then this volcanic Island will become an important sea-mark for sea going ships. Bayonnaise Island is very low and in rough weather it cannot be seen while Myojin-sho is large and can be seen without difficulty. If the volcanic activity becomes quite then the Island will become covered with vegetation and later it will be occupies by various animals, and the neighboring sea bottom will become a good fishing ground and the sea area which lies in the course of migration of southern types of fish will afford them an opportunity to flourish there, according the vicinity of Myojin-sho would become a very important fishing ground. The effect of the yellow stream flowing from the volcano is confined to a very restricted area around the Island, therefore it is evident that its effect to the migrating fish can be neglected.

Finally the writer takes this opportunity in expressing his thanks to Dr. Yoshikatsu Matsuike, President of the Tokyo University of Fishereis and to Dr. Junichi Ehara, Chief of the Department of Fisheries of the same university, for their encourgement in various ways.

Myojin-sho after the Second Survey of Myojin-sho

On March 9, 1953 there was a great explosion about 60 knots South of Aogashima according to the crew of the Hachijo fisheries vessel Zensei Maru (6.5 tons), and on the following morning (10th), it is reported that for a period of 30–40 minute the explosion smoke could be seen rising. At 7:30 am on March 11, 1953, tsunamis having a height of 6 meters came upon Hachijo-jima about 13 times. At 7:26 minutes and 26 seconds, the Central Meteorological Observatory recorded slight earthquake which is estimated to agree with the time of the explosion of Myojin-sho.

According to the March 12th edition of the Yomiuri Newspaper, the Yomi-

uri airplane left the Haneda air-port at 1:00 pm on March 11th to make a survey of Myojin-sho by photography. This air-plane when reaching lat. 31°56′ N., long. 140°5′ E., found that only a yellow stream could be seen pouring forth from the central part of where Myojin-sho originally was and that this stream with a width of about 2 km drifted southwards for about 4 km and this is shown in their photograph. But it is a question that Myojin-sho has disappeared from the sea surface.

At May 5, 1953; Shikine of the Marine Safty Bureau navigated about 8 nautical miles from Myojin-sho. At that time, the hight of the Island was 50 m and 200 m wide. The scale of the Island is as same as the Island observed by Umitaka Maru at February 1, 1953. But rack the high peak at the north corner and still spouted vapour.

At July 17, 1953; Ryofu Maru of the meteorological station navigatd near Myojin-sho and reported the volcanism of Myojin-sho.

Thus it is sure that Myojin-sho has been maintain its volcanic activity.

At August 26, 1953; Umitaka Maru pass near Myojin-sho. At that time, the volcanic island still remain about 50 m high and vomitted volcanic ashes and vapour. The following map shows the bottom configuration around Myojin-sho which assiumed from the record of Echo soundings obtained at this chance together with the former record.

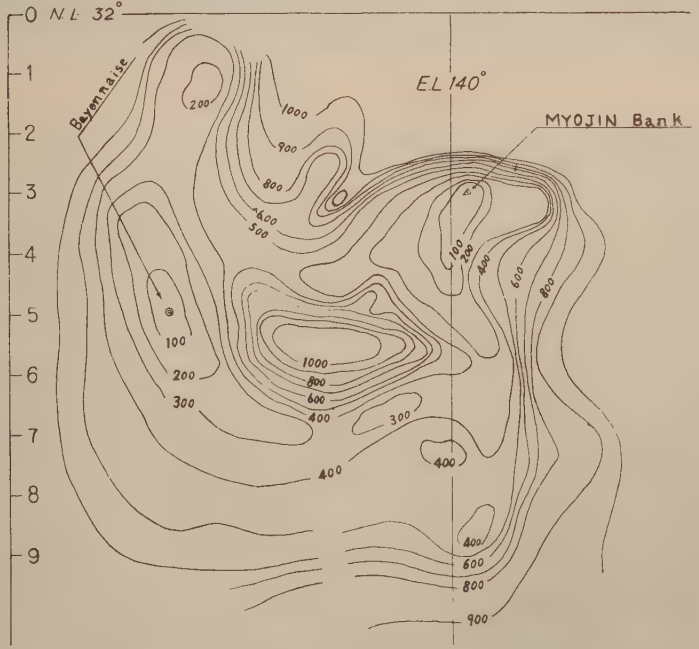

Fig. 4. Bottom Configulation of Myojin-sho, August 26, 1953.

PART II

PLATES I–V

PLATE I.

The second survey of Moyjin-sho.

Fig. 1. The training ship Umitaka-maru.

Fig. 2. At 3 pm on February 1, 1953, Umitaka-maru was brought within 1.8 knots of Myojin-sho and flowers, food and drinking water were thrown into the sea to pary for the persons who met their unfortunate disaster there by the sinking of 5 kaiyo-maru.

Fig. 1

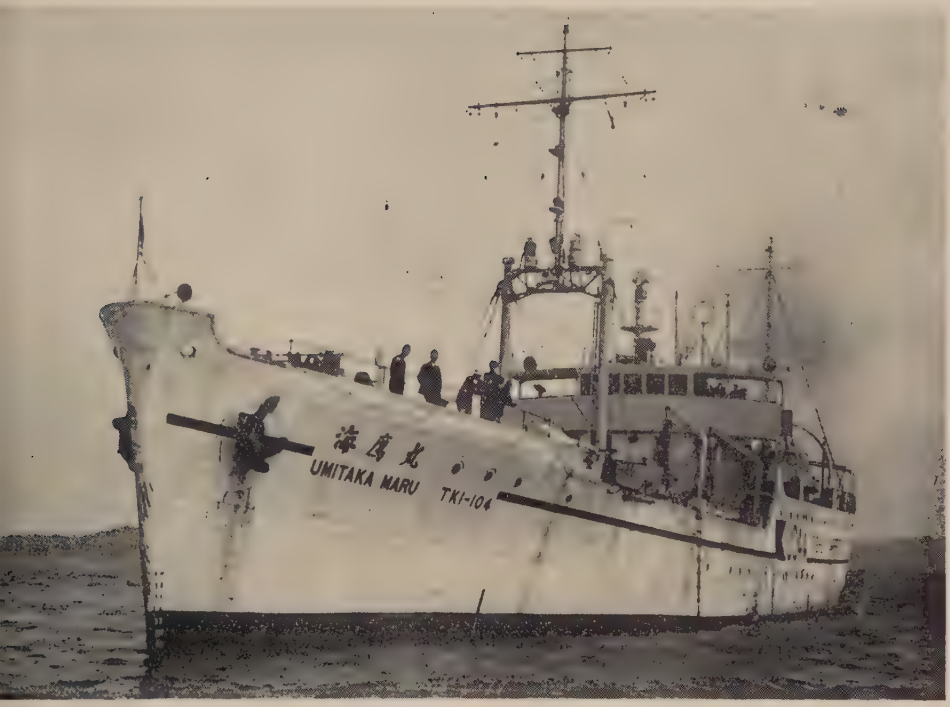

Fig. 2

PLATE II.

Sketches of Myojin-sho from 8 directions at 3 pm on February 1, 1953.

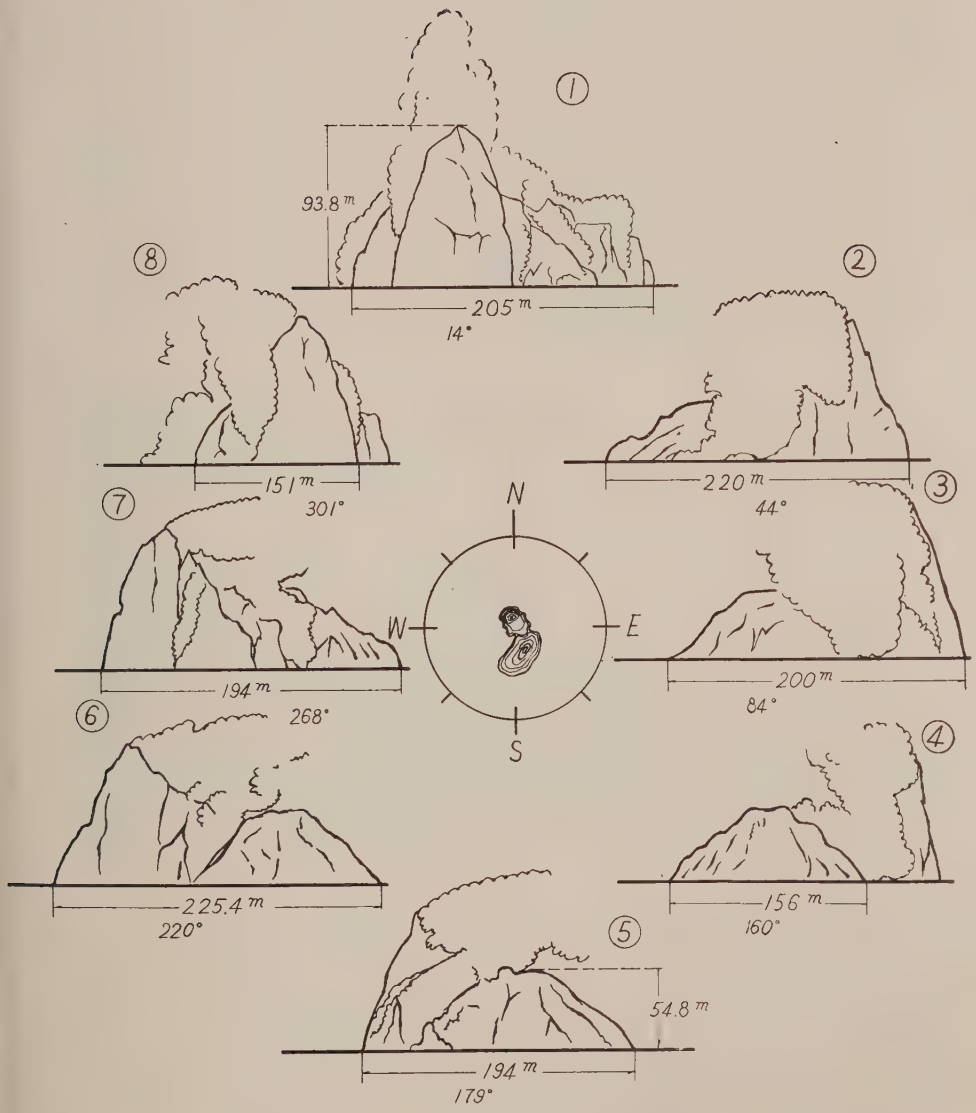
①
93.8 m
205 m
14°
②
220 m
44°
③
200 m
84°
④
156 m
160°
⑤
54.8 m
194 m
179°
⑥
225.4 m
220°
⑦
194 m
268°
⑧
151 m
301°
N
W
E
S

PLATE III.

Photographs of Myojin-sho at 3 pm. on February 1, 1953.
Fig. 1. The directions of photographing at Myojin-sho.
Fig. 2. Bayonnaise rock.
Fig. 3. Photograph of Myojin-sho from 14°.
Fig. 4. Photograph of Myojin-sho from 44°.

Fig. 1

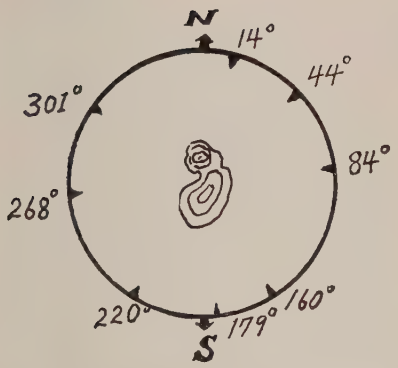

Fig. 2

Fig. 3

Fig. 4

PLATE IV.

Photograph of Myojin-sho at 3 pm on February 1, 1953.
Fig. 1. Photograph of Myojin-sho from 84°.
Fig. 2. Photograph of Myojin-sho from 160°.
Fig. 3. Photograph of Myojin-sho from 179°.

Fig. 1

Fig. 2

Fig. 3

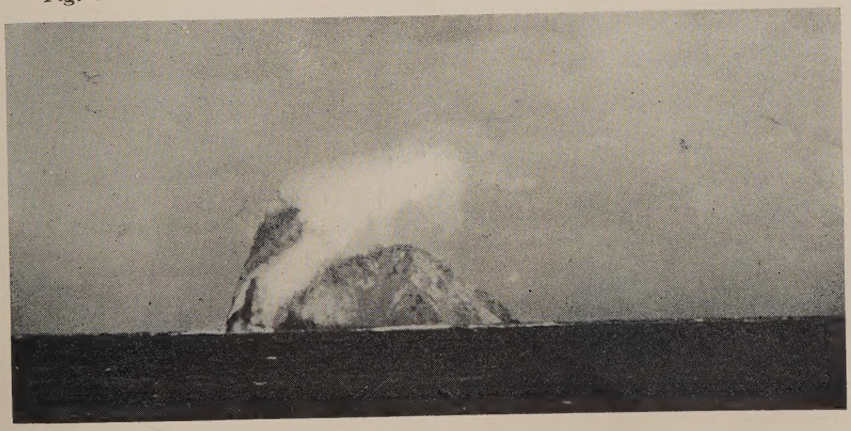

PLATE V.

Photograph of Myojin-sho at 3 pm on February 1, 1953.
Fig. 1. Photograph of Myojin-sho from 200°.
Fig. 2. Photograph of Mynjin-sho from 268°.
Fig. 3. Photograph of Myojin-sho from 301°.

Fig. 1

Fig. 2

Fig. 3